

PC & TECH AUTHORITY

TECH ADVICE YOU CAN TRUST

WINDOWS 10
TOUGHEST CRITICS APPROVE
EVEN HONEYBALL LOVES IT!


WORKSTATIONS
PRO PC ROUNDUP

63
CPU'S
TESTED

CPU

BUYER'S GUIDE

- All current chips rated for value and performance
- Ideal noob guide - all tech terms explained!

REVIEWS

MSI GE62 AND GE72, APPLE MAC PRO, CREATIVE X7, GIGABYTE BRIX S GB-BX17H5500, DLINK DIR 890L ROUTER, GIGABYTE X99-SOC CHAMPION, ANTEC P380, PHILIPS BDM3470 AND MORE!



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Getting to the core of things

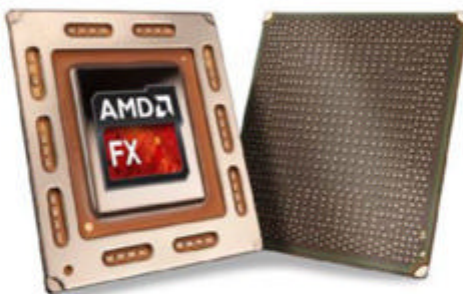
A pretty good issue, this one, I reckon. The big story is of course our somewhat massive CPU group test. I love it when we do this because it goes straight to the heart of the PC, and tackles the most important single component in your system, providing an amazing overview of that landscape – one that is reliably confusing without a guide like this.

It was a lot of work to put it together, as you can imagine, but well worth it. We chose to start the feature off with a simple explanation of CPU architecture and how various technologies are something to pursue... or not, depending on your needs and budget. Many of you will be able to skip through this part, I'm sure, but we do try to never forget that not everyone knows everything so a regular primer on this important stuff is always a good thing.

Moving some distance away from core components, we had a bit of fun with other features this month. I've always been curious, and suspicious, and well... paranoid about what I've decided five seconds ago to call 'dark marketing'. The tricks used to sell us stuff when we may only be browsing, to upsize our orders, to put offers in our face whether we like it or not.

That's the gist of our 'Buy Me' feature starting on page 18. The journals tasked to this job relished the mission and now I think we can all shop with just a little more paranoia as we fear the mind games at play by clever people far, far smarter than us. Or worst of all, folks with a lot less nous than us, but who think they're gifted with a special intelligence that entitles them to see us as prey. Sigh.

I actually wrote a line for our cover talking up that feature, but then in a rare moment of perspective realised the irony of pitching that story to help sell



our magazine, so I deleted it. Totally going to heaven now.

Meanwhile, in bums on seats land, we've a small piece on desk'n'chair ergonomics – or 'how my terrible posture was great fun in my 20s and 30s, but has now come back hard to bite me viciously, making working life a horrible misery in my later years'.

Take note, youngins, this stuff is important. I printed the exercise chart out and stuck it to the wall, where it's now totally ignored by my younger colleagues. But please be different and follow at least a couple of good body practises, your back will thank you for it when you need it most.

And, that's a wrap. Of course there's tonnes more in the pages that follow, and we all hope you enjoy, learn a little and perhaps end up deciding to buy something we fancied, and end up loving it, or, decide to avoid something we weren't too keen on, and are thankful for that.

See you all in a month!



Ben Mansill
Editor

bmansill@nextmedia.com.au

REAL TECH ADVICE YOU CAN TRUST!

- Our tests are performed by experienced reviewers in our Labs in accordance with strict benchtesting procedures
- Our brand new benchmarks have been tailor-made to reflect real-world computing needs
- We put tech through its paces – seriously. From processing power to battery life, from usability to screen brightness, our tests are exhaustive
- We will always offer an honest and unbiased opinion for every review

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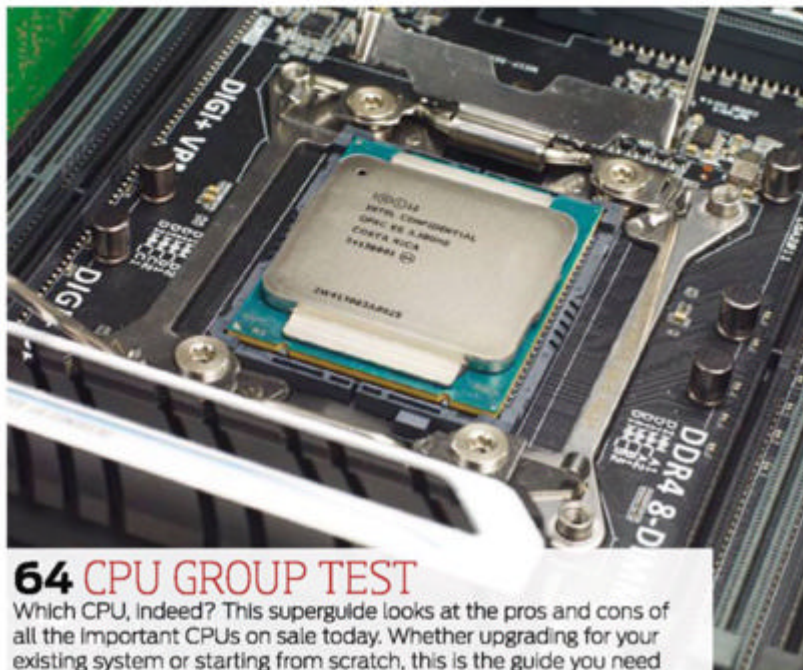
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TECH NEWS

The latest trends and products in the world of technology



18 BUY ME

Be aware, and slightly alarmed, as we peel back the layers of deception that tell your brain and wallet to act against your better judgement



REGULARS

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Buy me

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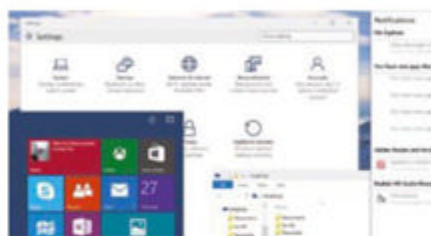
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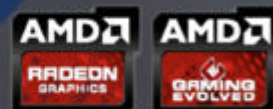
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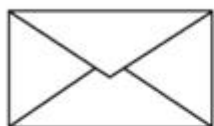
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INBOX

Readers write

LETTER OF THE MONTH

MORE DESKTOPS!

Good to see some reader inspired change to the mag. However there still not much on desktops and again plenty of individual component reviews have been done (especially SSDs).

I acknowledge the comment you sent some months ago in regards to vendors tweaking systems regularly. But surely a line can be drawn somewhere and a review of some good dektops can just occur. Like any piece of tech it will surely become outdated. However people will have to buy at some point otherwise they will never purchase anything because of always waiting for the next "big thing".

I now can't easily recall when the last time a full desktop system was reviewed outside of Kitlog. Please find a couple of good systems that can achieve around 75-90% of the reasonably priced best and decide whether to recommend. Also try this on at least a quarterly basis for your readers. I know I for one would be interested and I'm sure I'm not alone.

Jason

Ben Mansill replies: *Thanks Jason, I agree, there could certainly be more desktop reviews. From where we stand, the desktop world is dominated by majors like Dell and HP, and then you have the systems built to your spec by various smaller outfits. The big issue is shelf life, these systems change frequently, but that's no excuse. Surveys show that most readers (at least claim to) build their own systems, hence the bias towards components. Interesting laptops, too, are always considered for review. We will work on including more of the shelf complete desktops, though, thanks for getting in touch about this.*

MORE CRAP

Talk about serendipity! My wife has been battling with a ten year old laptop on

Windows XP which was being invaded from all directions, so I decided to bite the bullet and buy her a new Acer Aspire. I happened to spot your February edition with a great article on crapware. After starting up the computer we noticed a large number of crapware items so decided to download PCDecrapifier immediately in order to start with a clean slate. Imagine my surprise when, after doing the analysis, decrapifier stated that it could find nothing to ditch. I was "broken hearted, paid a penny and only farted....". Luckily we also installed Norton which then picked up 25 problem files and repaired them.

Albert

MORE POWER

Thank you for a fine magazine and I'd like to offer a small suggestion for improvement.

Your A-List laptop recommendations currently comprise a "Value" laplet that seems underpowered for most users (Atom processor, 1 GB of RAM and 8/16GB storage); as well as two expensive laptops and an expensive laplet.

I would find it more useful if one of the premium-priced recommendations were to be replaced by a one for a mid-range laptop (say in the \$600 to \$1000 range).

Dennis

Ben Mansill replies: *Point taken, Dennis. While the newer generation Atom CPUs are vastly more powerful than the original 'netbook' chips, there does appear to be a chasm in the price range of our recommendations.*

For now, the thinking is that each machine there is remarkable in one way or another, and that is certainly true of the little Asus TF103C there now, but there are many more, and when a perfect replacement is found then in it shall go!

DVD FOREVER

I am glad the sensible decision to retain the

cover DVD has been made.

Not everyone has a generous monthly data package. I have pre paid mobile broadband living out in the sticks with a tight monthly GB limit.

If you started adding programs to your website to download instead of a DVD I wouldn't bother.

So keep plugging out that DVD.

Tommy

WHERE'S DAN?

As a young reader, I thoroughly enjoy reading about all new tech news, and different articles.

But there has one that has seemed to disappear since February – the IO section. Since around Feb you have advertised that you have cleaned up the magazine – is this just a section that had to go, or did Dan disappear? :)

Sammy

Ben Mansill replies: *Alas, Dan and IO are no more for PC&TA. For now, at least. We loved Dan's very unique style too. I commissioned him to write IO back in 2000, for Atomic magazine, so we're big fans too.*

THE GLASS CEILING

As an in-my-60's guy, the steps may have been small, but we're a hell of a lot better than we were back in the 50's and 60's. Shame there's still so far to go.

Amcmo

LOTM WINNER



This month's comment of the month will receive a 512GB Crucial MX200 SSD!
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TECH NEWS

The latest trends and products in the world of technology

WORKING TO AVOID A "FORGOTTEN CENTURY" OF DATA

INTERNET PIONEER VINT CERF HAS WARNED THAT WE RISK LOSING A GENERATION OF DATA THROUGH "BIT ROT". **NICOLE KOBIE** SPEAKS TO ARCHIVING EXPERTS TO FIND OUT HOW WE CAN PROTECT OUR HISTORICAL INFORMATION

Today we can access blogs, tweets, photos and other files from anywhere, thanks to the cloud – but will we still be able to access them in the not too distant future?

Vint Cerf, Google vice president and co-creator of the TCP/IP protocol, warned in *The Guardian* that as the programs needed to view certain file types fall out of use, data will become inaccessible to future generations. "When you think about the quantity of documentation from our daily lives that's captured in digital form – such as our interactions via email, people's tweets, and all of the world wide web – it's clear that we stand to lose an awful lot of our history," he told the newspaper.

"If we want to preserve them, we need to make sure that the digital objects we create today can still be rendered far into the future," he added.

Experts say Cerf is right to worry "It's a challenge we're aware of," said David Clipsham, a digital-archiving specialist. "Nobody can predict the future, but we feel we're ahead of the curve."

Alongside the work being done in storing government documents at the National Archives, the US Library of Congress is even collecting tweets.

Nevertheless, Robb Moore, CEO of disaster-protected storage manufacturer ioSafe, shared Cerf's concerns. "Preserving and archiving digital data for long-term storage and retrieval is a problem," he told *PC & Tech Authority*. "Not only does the actual medium grow old, but the compatible devices that interface with the medium also get old," he said. "I have a Zip drive at home containing 10-year-old data. I'm sure it would be far from trivial to get it working on my new MacBook Air, with no drivers and no parallel port."

DVDs may be facing a similar fate: their 4.7GB capacity made them a popular backup medium a decade ago, but nowadays optical drives on laptops are few and far between. The advent of cloud storage may seem to alleviate such issues

– Dropbox users, for example, don't even know what sort of storage medium their data is kept on. But that certainly doesn't mean online storage is risk-free.

"Online content is most at risk in my opinion," warned Moore, "as the firm you're dealing with probably cares little about archiving your data. They might have a glitch, go bankrupt or change their policy, making retrieving that data impossible. It's up to you to archive whatever you consider precious or important."

It isn't only storage hardware that becomes obsolete: even if you can access old data, you may not be able to open it without the right software. "Generally, choosing the most generic formats is the best way to keep data usable far into the future," said Moore. "For pictures, it's JPEGs. PDFs and text files should also work well for the long term – I can't imagine a digital world where reading a JPEG or PDF will become impossible. If there does come a time when an old format is going away, you'll need to be diligent enough to perform a mass conversion to a more generic format wherever practical."

Clipsham told us that, while archiving official documents raises challenges, the government's file formats were "pretty homogeneous": most arrive as standard documents and images, with 99% of files in fewer than 20 file formats. Many of these have already had a long life: GIF, for example, came out in 1987, but "it's as popular as ever", Clipsham said. "The wider-known formats tend to not go away. That said, we do maintain an internal software library to be able to understand formats when we need to, and we sometimes use emulation."

For those dealing with only their own data, Moore recommended "saving it forward" to keep data safe. "Every few years I migrate my entire data wad to my next new device," he said. "I work to keep everything, both old and current, on a single master volume, backed up to multiple targets."

SNEAK PEEK AT WINDOWS 10 FOR SMARTPHONES

Microsoft is giving Lumia owners an early taste of Windows 10 on their phones

Despite Microsoft's promise of a single operating system for all devices, the first Windows 10 preview builds have been for desktops and laptops only. However, the company has moved one step closer to its vision of a unified OS by releasing a version of Windows 10 that will work on a limited number of Lumia handsets.

HOW TO GET IT Want to try Windows 10 on your handset? First, you'll need to join the Windows Insider Programme (insider.windows.com) and register your device. This will install the Windows Insider app on your phone, after which you can follow the prompts to install the new OS. If it all goes terribly wrong, you can always roll back your device to Windows Phone 8.1. Microsoft said most Lumia handsets will be upgradeable to Windows 10, but only a small number currently work with the Technical Preview, namely the Lumia 630, 635, 636, 638, 730 and 830. Treat this list with caution, however: we tried to install Windows 10 on the 830 without success. Higher-end handsets, such as the 930 and 1520, will eventually be supported. Programme manager Gabriel Aul warned that you may not want to use the new operating system on your main handset. "You will encounter bugs," he admitted, but added that this is to be expected given this is the "earliest publicly available preview" for Windows on phones. "You will likely feel like this first preview build for phones seems 'less complete' or 'earlier' than the PC. That's true – it is."



THE PC OF F1

Bennett Ring shares some quiet time with the Mercedes F1 team discussing the fusion of racing and computing

In the lead up to the commencement of this year's Formula 1 season, Epson announced that it had signed a multi-year sponsorship deal with the world champions of the sport, the Mercedes AMG Petronas team. As well as an undisclosed sum of sponsorship money, Epson will be providing the team with key products from Epson's product range. Ian Cameron, General Manager of Brand and Communications at Epson told *PCTA* that Epson would be the, "...primary supplier of printers, projectors, scanners and wearables – pulse sensing and GPS watches, as well as our smart glasses."

We were invited to the Mercedes AMG Petronas pre-race breakfast, held in St Kilda during the week before the Melbourne race, where we had a chance to sit down and chat with current world champion Lewis Hamilton, and fellow driver Nico Rosberg. With Epson's continued development of the Moverio Smart Glasses, which use Augmented Reality to provide a personal Heads-Up Display (HUD) inside the glasses, we were curious to see how the drivers felt this technology might impact the sport. Given that HUD technology has existed for decades, Lewis is keen to start working on this technology in the near future. "I've asked the question (about the lack of a HUD) many times. Until now we've not had the technology to do it. I had a meeting just a couple of days ago, and was asking why helmet technology has been the same since I started." He believes that a helmet with HUD could make the task of driving much easier on the drivers. "The less things I have to worry about, the better I can drive. But at the moment we have a huge display on our steering wheel, that tells you so much, so much stuff. And you have to take your eyes off the road for a split second to look at it, to be able to adjust to it. If we had a HUD, we could just catch it in the corner of our eye."

Epson's Ian Cameron also described

a practical way that Moverio could be employed immediately, as it would allow rapid communication between the trackside team and the decision support team who are based in the UK. "Imagine that the car has an issue. Rather than having to carry a video camera to show a bent fender so the team can see it, the mechanic can just look at it through the glasses and throw up the schematics on the heads up display. The mechanic at the track can see that information and fix it right there in real time."

While Epson projectors, scanners and printers will handle the logistics of keeping the team's information flowing during the hectic season, another key new product from Epson has opened up possibilities that have been surprisingly absent until now. It's new pulse-sensing, GPS equipped wrist-watch could enable in-car Biometric monitoring, which hasn't been practical until now. Nico Rosberg explained, "Often we have difficulties with the older heart rate monitors in the car, because there's so many electromagnetic systems in the car. Maybe the Epson watch will work as it's direct, it doesn't need a heart rate sensor on the chest. If it does work, it will be really interesting to gather some data to see how the heart rate goes in the race car."

Lewis agreed that this kind of information could prove of benefit to his training regime, stating that, "This is what's interesting, as we haven't done that kind of testing before. That's why this is an exciting part of working with Epson. At the moment we aren't using any of the gear, so the first part of the process is seeing what fits, and then to start to use it in training".

Whether the Formula 1 officials will allow the development of in-helmet HUD displays is yet to be seen, but even without Epson's technology the Mercedes AMG Petronas team went on to win the Melbourne race with a commanding one, two finish. No doubt Epson were very happy about this, especially with their prominent logo placement on the driver's helmets and cars. It'll be interesting to see how the relationship between the team and Epson evolves, as it could deliver new products for consumers. Ian Cameron explains, "Absolutely, this is a two-way relationship. We'd love to customise some of our products and do some testing with the team. F1 is the pinnacle of modern racing, and it's the toughest environment for us to test our products in."

HOT... OR NOT

HOT

NVIDIA TITAN X

Yes, it's super -premium and quite expensive, but Nvidia's new single-GPU monster reminds us of the good old days when a 30-40% jump in performance for a new generation wasn't uncommon. Having all this oomph in a single GPU makes 4k feasible, and without the headaches of SLI or Crossfire.



NOT

AMD DRIVER SUPPORT

Four long months between graphics driver updates, while Nvidia has been churning them out regularly to support all the important new games. Four months, and all we get is a beta driver that supports just six new games, including Project Cars which isn't even out until May. Not good enough AMD.



CORRECTION

In issue 209 we inadvertently cut short some text from the Windows Annoyances feature on page 26. We apologise for this error. The complete text is below.

My music library is full of files with names such as "albumart_{e6043a1c-bbeb-49c5-b3f0-5259b6312c34}.large.jpg" – how do I get rid of them?

These are the thumbnail art files for your music tracks; they're downloaded by Windows Media Player on all recent versions of Windows, and they're usually hidden, so there isn't normally a need to get rid of them. The bad news is that, at present, there's no way to stop Windows Media Player from creating these files (disabling "Retrieve additional information from the internet" ought to do it, but doesn't). Pending a new version of the software, the best course of action would be to switch to a different media player.



GAMING NEWS

One day everything will be virtual

MOVE OVER OCULUS: HTC VIVE

Valve and HTC's VR headset lets you roam the room

Valve is set to shake up the growing virtual reality market with its recently unveiled Vive - a headset developed in collaboration with Taiwanese smartphone giant HTC that uses positional tracking sensors to get users off the couch and moving about their real-life surroundings, bring us one step closer to a real-life Holodeck, Danger Room, Matrix training simulator, or whatever other VR pop-culture reference you've been holding out for.

Receiving rave reviews from those lucky enough to receive hands and eyes-on time with the device at the Mobile World Congress in Barcelona and the Game Developers Conference in San Francisco, both of which took place in early March, the Vive relies on a pair of sensors placed in the corners of a room aided by a built-in gyroscope and accelerometer to keep track of the location of the user's headset and map that position in the virtual

environment, providing a level of immersion beyond that of the Oculus Rift and Sony's Project Morpheus.

Though moving around a real space with a headset blocking your vision might sound like a fool's errand and the perfect way to end up with a bump on the head, Valve and HTC's innovative tech also keeps tabs on the boundaries of your available space which can be up to 15 feet squared (just over 4.5 metres squared) to prevent nasty collisions. When you approach the wall in real-life a virtual grid appears in the virtual reality environment as a warning.

The developer edition of the headset features two 1200 x 1080 screens running at a slick 90-frames-per-second refresh rate (slightly slower than Sony's 120 fps for the Morpheus, but well above the 60 fps of Samsung's Oculus based GearVR) which Valve and HTC say provides a photorealistic visual experience that lets you look around the virtual environments

naturally without the jitter common to previous VR devices.

The Vive also comes with a pair of ergonomically designed controllers, one held in each hand, which resembles a cross between a Steam Controller split in half and Sony's PlayStation Move wands. They feature touchpad discs where the thumbs rest and triggers on the back for index fingers, as well as a hexagonal top-piece that is tracked by the room sensors much like the headset, allowing developers to provide control schemes that better mimic the natural movements and actions of your hands.

While it's not yet clear exactly what sort of games to expect, demos from the MWC and GDC included a short interactive sequence set in the Aperture Science research facility of Portal. The Vive will soon be available for developers, while consumers will need to wait until sometime later this year.



2014 GAME SALES DIGITAL SALES BOOM

Mobile and digital downloads take centre stage

The Australian videogame industry had a banner year in 2014, with new research showing a total of \$2.46 billion in sales, up 20% from 2013. The research, published by the Interactive Games & Entertainment Association (IGEA), found digital sales increased by a whopping 39% to a total of \$1.248 billion, narrowly outperforming the similarly strong performance of traditional brick-and-mortar stores.

While there was a slight decline in retail software sales, down 5% to the still astonishing \$615 million, digital downloads increased 25% to a total of \$455 million - unsurprising if you're amongst the 125 million users of Steam or its competitors. However mobile game devs were the big winners, with sales increasing by 56% to exceed \$700 million - the majority of which was generated through in-app purchases.

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CHIP NEWS

A CPU not made of Silicon? **Mark Williams** wonders why Intel is passing GaAs through its fabs while it puts an X factor into its Atom range, then looks at how AMD and Nvidia will be locking horns over the next single GPU performance crown

CPU

ATOM SKU REBRAND

With the launch of its new Atom line-up Intel have taken the opportunity to simplify the model numbers a bit and bring them more into line with how their "Core" (i3, i5, i7) range of products are marketed.

The Atom range will now also be segmented into 3 parts and will be branded as x3, x5 and x7 parts.

This is more than just a rebranding though. It ushers in Cherry Trail, the 14nm shrink of Bay Trail (x5 and x7 parts) and merges Intel's SoFIA products under the Atom brand name too (x3 parts).

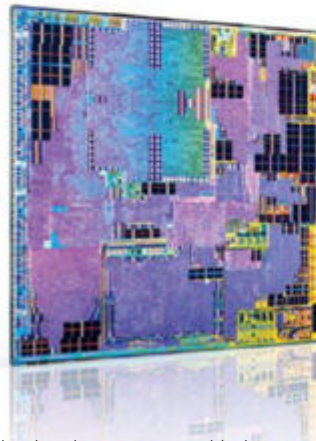
The Atom x3's are Intel's push into the cheap smart device market, specifically with Asia and India in mind. With dual-core 1GHz CPUs up to quad-core 1.4GHz CPUs paired with ARM based Mali graphics and 3G/LTE modems, Intel is claiming to have 40-60% faster CPU's than similarly classed Qualcomm and MediaTek SoCs.

The quad-cored x5 and x7 ranges are

where the previous generation Atom's slot into and have essentially been given the Broadwell treatment. Shrunk down to 14nm, running at essentially the same speeds (1.84GHz – 2.4GHz) with a few points of IPC increase but with a huge IGP boost with more execution units being added thanks to the node shrink space savings, we're looking at potentially upwards of 50% gains in graphics performance for these.

PUSHING SILICON OVER THE EDGE

As Intel continues to ramp up its 14nm process, its R&D is already focusing on the next process nodes. 10nm seems to be a safe bet at this stage after 14nm, but



◀ A die shot of the new Atom x3

at the recent International Solid State Conference (ISSC) Intel revealed that while 7nm was previously thought to be achievable with silicon, it might be a step too far.

At 7nm, silicon transistors sit so close to each other that an effect known as quantum tunnelling occurs, meaning transistors that should be off, instead will

likely stay switched on, messing up those 1s and 0s our computers like so much.

A short term solution to push to 7nm and beyond is looking likely by using indium gallium arsenide (InGaAs) and indium phosphide (InP).

As these materials can be used with existing manufacturing techniques and don't suffer from quantum tunnelling (yet), the main obstacle now is working on yields and costs for this process.

GPU

TITAN X

Nvidia's monster new king card has been unleashed, and its performance is staggering.

Dubbed the Titan X (GM200), it's the successor to the Kepler-based GTX Titan Black, but under the hood it's the full fat big daddy to the current top-line Maxwell-based GTX 980 (GM204).

When I say big daddy, I mean big. From the specifications that have leaked so far it seems that Nvidia has taken the GTX 980, fed it some protein shakes and grown it by a massive 50%, in every important respect.

GPC count has gone from the GTX 980's 4 to 6, meaning a grand total of 3072 CUDA cores up from 2048. Texture units have risen from 128 to 192, ROPs from 64 to 96, memory bus from 256-bit to 384-bit, memory bandwidth from 224GB/s to 336GB/s and TDP from 165W to 250W. Clock speeds are about the same however at 1000MHz base and 1075MHz boosted.

The only thing that didn't double was the VRAM. From the GTX 980's 4GB, the Titan X *triples* that to a massive 12GB.

This is truly a beast in the making. Early leaked benchmarks, when compared to an R9 290X averaged across 19 games at 4K resolutions, where the GTX 980 is 8% faster, the GTX Titan X is over 46% faster and with some overclocking may even close down the gap to the dual GPU Titan Z and R9 295X2 cards!

390X

Not to be outdone, AMD has an ace up its sleeve too.

More leaks show us that AMD's next top end card that'll stand toe-to-toe with the Titan X is the R9 390X.

Leaked specifications thus far give it 4096 shaders (about 45% more than the 290X), a 50MHz core speed bump to 1050MHz and 8GB of VRAM with (thanks to fancy HBM technology) a massive eight fold increase in memory bus width to 4096-bit.

With leaked benchmarks putting this at 49% faster than the 290X (3% more than the Titan X) and what looks like a water cooling edition of the 390X in the wings, this round of card releases is shaping up to be a great battle for the single GPU crown.

♥ The GTX Titan X



Apacer

Extreme DDR4 Gaming Memory Up to DDR4 3200MHz !!



Commando **DDR4**

OVERCLOCKING MEMORY MODULE

Tailored for the latest Intel® X99 chipset and Haswell-E processor
Supports the latest Intel XMP 2.0 standards



Frequency	CL Timing	Voltage	Capacity
DDR4 2400 MHz	16-16-16-36	1.2V	16GB(4GBx4), 32GB(8GBx4)
DDR4 2666 MHz	16-16-16-36	1.2V	16GB(4GBx4), 32GB(8GBx4)
DDR4 2800 MHz	17-17-17-36	1.2V	16GB(4GBx4), 32GB(8GBx4)
DDR4 3000 MHz	16-16-16-36	1.35V	16GB(4GBx4)
DDR4 3200 MHz	16-16-16-36	1.35V	16GB(4GBx4)

SYD

J & W computers
<http://www.jwcomputers.co.uk>

MWAVE
<http://www.mwave.com.au>

MEL

PC CASE GEAR
<https://pccasegear.com>

Centre Com
<http://www.centrecom.com.au>

Scorpion
<http://www.scorpiontec.com.au>

QLD

Umart
<https://www.umat.com.au>

Computer Alliance
<http://www.computeralliance.com.au>

PERTH

PLE Computer
<https://www.ple.com.au>

MOST WANTED

Groovy gear



Bluesmart

This product answers one simple question: in a world of smartphones, smartwatches, smart bands, and a plethora of other smart devices: where can I find smart luggage? Bluesmart is a super-stylish, light, and ingenious carry-on suitcase for the modern traveller or tech head looking to show off that started life as the 11th most funded project of all time on Indiegogo, raising just over \$1.9 million dollars from 7000 backers around the world.

Bluesmart can be locked remotely via a Bluetooth connected iOS or Android device, provides alerts and will automatically lock if you drift too far away from your bag, and in the event that your bag is lost or stolen can utilise other Bluesmart owner's devices to track down its location. If that's not enough to solve all your travel issues, it also has a built-in digital scale so that you can easily check the weight of your bag to make sure it meets your chosen airline's cabin requirements. You won't even need to worry about the battery life of your smartphone or tablet, what with all that Bluetooth connectivity, as the Bluesmart comes equipped with a 10,000 mAh capacity battery capable of charging an iPhone six times over.

It's only US\$299, and is expected to begin shipping October of this year.

www.bluesmart.com



Energizer EcoAdvanced Batteries

We might not be using alkaline batteries for quite as many devices as we once did, but those little steel-cased disposable powerhouses continue to cause a bit of a headache for the eco-friendly amongst us, with most AA and AAA batteries finding their way into landfill once their charge is depleted.

That's where the Energizer EcoAdvanced comes in. It's the world's first battery made with four per cent recycled battery material, so you can feel a smidge better about all those hours spent on the couch channel surfing and burning your way through the batteries in the remote. The new product range, in development for the last seven years, lessens the impact on the environment by reducing the need for new materials and decreasing the overall number of batteries finding their way to our local tips. Energizer also claims the EcoAdvanced range offer better performance than the company's other alkaline batteries which contain no recycled materials. And though just 4% recycled material may seem a little low for the time being, Energizer aim to increase the amount of recycled material to 40% by 2025.

The batteries will be available in AA and AAA sizes from the second quarter of this year starting at \$9.99 RRP for a AA 4 pack, and \$10.49 for a AAA 4 pack – a small price to pay to be more environmentally friendly.

www.energizer.com/ecoadvanced



Sesame

While it's certainly not the first smart-lock to provide an over-engineered solution to the simple task of remembering to take your keys with you when you leave the house (is it really so hard?), the crowdfunded Sesame is perhaps the most simple and well designed product of its kind that we've seen so far.

Retailing at US\$149, Sesame let's you unlock your door using an app that's installed on your phone, or with a custom knock on your door.

If you've locked yourself out sans-keys and need to get back in, headed out and think you may have forgotten to lock your door, need to let in a guest who has arrived earlier than expected you can do so simply and easily from your phone.

Sesame's remote lock mechanism is designed to fit over just about any deadbolt in Australia, and is taped on with 3M Command tape – there's no need to swap or remove anything, nor use any tools.

The BIPAC 7800NXL, Keeping You Connected

It is easy to see why the BiPAC 7800NXL all-in-one modem, continues to be a favourite amongst Billion fans. With Gigabit Ethernet and 300Mbps Wireless-N, plus support for 3G/4G networks and Network Attached Storage (NAS), the 7800NXL offers maximum connectivity with minimum interruptions.

The 7800NXL's impressive list of features include:

- NBN ready ADSL2+
- IPv6-capable
- Gigabit Ethernet WAN (EWAN) port
- 4 Gigabit LAN ports
- Triple-WAN ports for 3G/4G LTE

For more information on the Billion BiPAC 7800NXL or for a full list of Billion stockists Australia-wide, head to billion.com.au.



FREIGHT FORWARDING GOTCHAS

Anthony Caruana examines the advantages and pitfalls of buying from OS sites and shipping goods to Australia



While we live in a globalised economy certain things haven't changed over the last 300 years of global trade. It can be really difficult to get an item shipped from one country to another.

Large companies work around this by having their own dispatch and transport systems but for individuals it can be harder. That's where freight forwarding services are useful.

Freight forwarding services provide vendors with an address they'll ship to. The forwarder will then on-send the item to your address. Let's say you're planning to buy a new electronic gizmo from Amazon but they won't ship to Australia. You can tell the freight forwarder what you want to buy and they make the purchase on your behalf, shipping it to you from their US distribution point. Other services provide you with a US shipping address that you use as a delivery address and items are then sent on to you.

The other benefit, aside from shipping, is that some of these services can complete purchases from vendors that won't accept Australian credit cards.

While the process sounds simple, there are several points at which it can all go pear-shaped and make your much-anticipated purchase into a shopping horror story.

EXCHANGE RATES

It's most likely that any purchases you make using a freight forwarding service will be made in either US dollars or Euros. The Australian dollar is currently falling against those currencies so our buying power is far weaker today than it was a year ago.

It's important to understand that exchange rates are volatile and what might have been a reasonable deal last week might not

“there are many different hands involved in shipping a parcel to another country”

offer the same bang for buck today. So, be prepared for the final cost, once the entire transaction is complete to be different to what you expected at the start.

Some services won't finalise the cost of the transaction until the entire process is complete. Others provide a firm price at the start of the process that includes some protection, for the service provider, should exchange rates fluctuate. Others simply charge for the shipping from the US to Australia.

Before engaging a freight forwarding service, look at how they charge fees and manage exchange rate changes.

SHIPPING COSTS

Different freight forwarding services use a variety of shipping partners. For example, Australia Post's recently launched service, ShopMate, uses the US Postal Service. PriceUSA uses UPS while some use DHL, FedEx and other logistics companies.

It's worth getting quotes from multiple services when shipping an item. Also, if you're making several purchases look into services that allow you to consolidate multiple items into a single shipment as this can cut your costs substantially.

In our research, we got quotes to ship an item valued at \$150USD that came in a 20x20x20cm box and weighed 3kg. Quoted prices ranged from about \$60AUD up to almost \$310AUD depending on how fast we wanted the item and

which logistics provider we chose.

What if it goes wrong?

We spoke with Matthew from Sydney about his recent experience with ShopMate.

“I ordered an out-of-print book from an Amazon Marketplace seller. It arrived at the U.S. depot not long afterwards, and I paid for the shipping to Australia. After a few weeks of not hearing anything I went to ShopMate's tracking page, which said it had arrived in Australia two weeks earlier. I phoned AusPost, and apparently it had gone to Customs for inspection, then they'd got the paperwork back from Customs but not the book”.

Anyone who's lost a parcel in the post knows that Australia Post has processes for launching investigations. Interestingly, they launched two separate investigations for Matthew – an Australia Post one and a ShopMate one.

Matthew's parcel did show up but it wasn't all good news. “Since then I've received another notification that it's arrived in the US and asking me to pay to ship it back here. Subsequent emails to ShopMate have gone unanswered and I still don't have my book,” he said.

This highlights the complexity behind such services. Although it looks simple on the surface, there are many different hands that are involved in shipping a parcel from one country to another. Understanding that and choosing an experienced operator with solid tracking systems and a good reputation will help make the process as smooth as possible.



Anthony Caruana has worked for almost every major masthead in the Australian IT press. As an experienced IT professional – having worked as the lead IT executive in several businesses, he brings a unique insight to his reporting of IT for both businesses and consumers.

NEED HELP? EVER HAD AN ISSUE AS A CONSUMER? INVESTIGATOR CAN HELP.

If you've had an issue or had something happen and you think investigator could help, email your problem to investigator@pcandtechauthority.com.au

REDDER, MEANER, BETTER THAN EVER



PALIT Get ready, gamers and enthusiasts! Encounter a new kind of thrill as Palit delivers unmatched performance and extreme capabilities with its new GeForce® GTX™ 960 JetStream series that includes the GeForce® GTX™ 960 Super JetStream and the GeForce® GTX™ 960 JetStream.

GEFORCE® GTX™ 960
SUPER JETSTREAM

REDDER EXTERIOR

Faunting the Palit GeForce® GTX™ 960 JetStream series cooler's bright red fan, which now sports a fan profile that is known as 0-dB Tech that stops the cooling fans for quiet operation, Palit's new cards will fire up your mood and stimulate you to be focused on your game!

MEANER CAPABILITY

The GeForce® GTX™ 960 JetStream features NVIDIA's next-generation Maxwell architecture, GPU Boost 2.0, Dynamic Super Resolution technology, MFAA technology (Multi-Frame Sample Anti-Aliasing) that lets you enjoy games in high quality without sacrificing performance, 3D Vision Surround, PhysX technology, GameWorks and GameStream technology, Adaptive Vertical Sync, PCI Express 3.0 support, support for four concurrent displays, and it is SLI-ready and G-SYNC ready to prevent screen tearing and stuttering. The GeForce® GTX™ 960 Super JetStream also features ThunderMaster OC utility, 4K Shadow Play, and GeForce Experience. The GeForce® GTX™ 960 JetStream, on the other hand, is essentially the same card, with lower operating clock speeds.

BETTER PERFORMANCE

Palit's JetStream series has a Dual Fan design that offers double the cooling performance, and combined with the 9CM-9CM Smart Fans that consist of dual fans with alternating blade rotations (each adjacent fan rotates in a different direction to reduce airflow conflicts and effectively improve overall cooling performance), the heat is effectively removed from hot spots. The Palit's JetStream series also features the TurboFan Blade that is designed to improve cooling performance by generating a powerful air stream and air pressure, and its thermal solution provides ambient lighting to further immerse gamers into the gaming world.



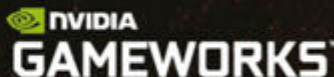
KEEP SILENT

Keep Silent while you are experiencing the multimedia application and general workload. The operating fans only occurs while working on heavier loading such as gaming that either GPU temperature surpasses 60°C or total board power over 60W.



DUAL ULTRA HD 4K

With its HDMI and DisplayPort ports, the Palit JetStream provides a flawless, jaw-dropping experience using dual 4K monitors.



ENHANCED GAMEPLAY EXPERIENCE

NVIDIA GameWorks lets gamers change the settings of Ubisoft games (e.g., adjust the graphical details of the shadows) to see unique visual and gameplay innovations.



Ultra

Percentage Closer Soft Shadows (PCSS)



GEFORCE GTX 960 SUPER JETSTREAM

- CUDA Cores: 1024
- Core Clock: 1279MHz
- Boost Clock: 1342MHz
- Memory Config: 2GB, 128-bit

GEFORCE GTX 960 JETSTREAM

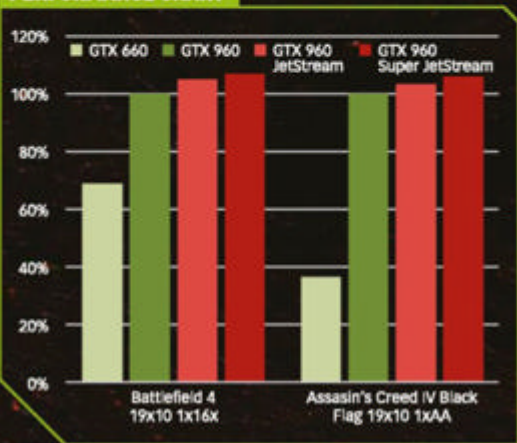
- CUDA Cores: 1024
- Core Clock: 1203MHz
- Boost Clock: 1266MHz
- Memory Config: 2GB, 128-bit

OVERCLOCKING
PERFORMANCE

EXTREMELY
QUIET

EXTREMELY
COOL

PERFORMANCE CHART



BUY ME

THE PSYCHOLOGICAL TRICKS
THAT MAKE US CLICK



How do online stores convince you to buy products that you really don't need? *Barry Collins* exposes the secrets of the online retail industry

We're all wise to the tricks that bricks-and-mortar stores use to tempt us to buy. Wafting the smell of freshly baked bread through the supermarket, knocking a penny off prices to make them appear a pound cheaper than they really are, and using bright lighting to make goods seem fresh and inviting. Less familiar, however, are the subtle – and sometimes not-so-subtle – techniques that are now used online to make us part with our credit card details.

Online stores deploy all manner of psychological triggers to ensure that you don't leave the site without putting a couple of items in your basket – the items that they want you to buy, that is, which might not necessarily be what you set out to purchase in the first place. The placement of buttons, the carefully selected reviews from fellow customers, the product photos, the colours of the action buttons and even the design of the "checkout" itself have all been tailored and tested to maximise the site's conversion rate – the proportion of site visitors who are "converted" into paying customers.

If you want to avoid being swayed by such tactics, you need to learn what to look for when browsing online stores. We've spoken to experts in online psychology and retail design to expose the methods used by leading online sellers. We've surveyed the sites of household names such as Amazon, Asos and EasyJet, to show you exactly how you're steered towards making a purchase. And we also reveal how to get your own back, by taking advantage of the retailers to get a better deal for yourself.

SOCIAL PROOF

Human beings are hugely affected by the opinions of their peers. As psychologist Graham Jones, author of *Clickology: What Works in Online Shopping and How Your Business can use Consumer Psychology to Succeed*, explained to *PC & Tech Authority*: "Part of the social glue that holds us together is that we like the things our friends like – it's the fuel that keeps the group going. It's a way of social groups reducing conflict."

What this means in practice is that if we feel even a vague affinity with someone, we can't help placing a value on their preferences and decisions – even if we've never met them, or have zero proof that they actually exist. It is precisely this that Amazon and other retailers are banking on when they cram their homepage and product pages with boxes claiming "people like you also bought this". According to Jones, "they're using the psychology of 'social proof' to get you to buy things that, actually, you may not even have considered buying. Now your brain is saying 'well, I ought to have it, because

people like me have it'."

The degree to which retailers personalise their recommendations varies, but the pull is more powerful the more you feel you have in common with fellow purchasers. Stores may harvest personal data supplied at registration, along with your buying history, to highlight reviews from those with similar traits. You may even be offered discounts for filling out surveys, to give stores yet richer information on which to base their recommendations.

"It isn't only about having user reviews on there, but providing a point of identification," said Emma Travis, a strategist at retail conversion-optimisation specialist PRWD. "If you could include the gender, the age, and the interests of the person doing the review, for example, that will help someone visiting your website to say 'if it's suitable for them, it's suitable for me.'"

Sometimes sites combine social proof with another very powerful trick – appealing to people's egos. "LinkedIn does this very well," said Nathalie Nahai, a digital strategist and author of *Webs of Influence: The Psychology of Online Persuasion*. "They might put up '20 things every exceptional boss should know'. Then they'll use a lead saying 'good bosses do XYZ, exceptional bosses do more'. You've already bought into the idea of being a good boss, and of course you want to be exceptional, so you have to read on, and end up being sold to."

The ultimate endorsement comes from those you know personally. For example, Google uses the homepage of the Play store to promote items that have been rated by your contacts, even going so far as to show you their photo alongside an image of the product itself. The store also encourages you to "follow" others in your social circles to "learn from people in the know", increasing the trust you place in the store itself.

This tactic might seem less manipulative than other methods of online selling, since you're being shown the genuine opinions of your friends. But don't for a second

"If we feel even a vague affinity to someone, we can't help but place value on their preferences"

Psychology of Influence

Robert B Cialdini, author of *Influence: The Psychology of Persuasion*, characterises “influence” as the cumulative effect of six factors. It’s striking how clearly these align with the triggers exploited by online retailers: websites play on our fears of scarcity, draw on social proof and appeal to authority.

Reciprocity

“They’ve been good to me, so I feel I owe them.”

Scarcity

“I don’t want to risk missing out.”

Commitment & consistency

“I’ve said I’m interested – I can’t back out now.”

Influence

Authority

“The experts seem convinced, and they should know.”

Social proof

“Friends say it’s fine; friends say it’s good.”

Liking

“These seem like nice guys – why not help them out?”

think that the items in question have been highlighted purely because they're popular. "They'll be selective in what they're pushing," warned Jones. "The retailer will be choosing the items that are the most profitable for them to sell to you."

At the opposite extreme, even the endorsements of entirely anonymous customers can encourage us to buy. Travis said that sites can see a huge upswing in sales simply by promoting a USP such as "nine out of ten of our customers" rate a product highly. "We've run an experiment with one of our clients, where they put a USP bar on their homepage with social proof in it," she told us. "It actually increased the key conversion rate by 20%."

What about negative reviews? You might think that the presence of the odd one-star review proves that you're not being steered in a particular direction – but that's exactly what the retailers want you to think. "Having negative reviews is actually likely to increase trust, because it says 'we're not perfect,'" Travis pointed out. If the negative review includes a response, that's a further feather in their cap, because it shows the customer that the site cares about complaints.

PRICING TACTICS

Online retail is a highly price-sensitive business. Amazon has spiders constantly crawling other websites to check prices, and might change its own prices several times a day if better deals are detected elsewhere. However, setting prices isn't merely about undercutting the competition: there are some crafty psychological tricks that can be deployed here too.

Most buyers have become wise to the age-old practice of knocking a penny off a round number, to make us perceive the price as lower. But taking off a few more pence can be enough to give this trick a second wind. "Online, you'll see lots of prices ending in seven," said Jones. "When you sell at \$9.99, you don't sell quite as many as you do at \$9.97. It appears that the extra couple of pence makes people think it's cheaper."

This isn't the only exploitable trick our brains play on us. "There's evidence to suggest that the longer it takes to say the words in the price, the more expensive we

think it is," revealed Jones. "On television, those adverts for the latest sales at DFS won't say this is 'six-hundred and ninety-nine dollars' – they'll say this is 'six-nine-nine'. Retailers will all be looking for ways to reduce the number of syllables in a price, because when we read it, we hear it in our heads. We need to 'hear' those prices in as short a time as possible."

The same principle can be used to put a more effective spin on sale offers, according to Nahai. Our brain processes numbers more quickly than it does words, so websites will generally do best when advertising goods as "50% off" rather than "half price", "two for the price of one" or "buy one get one free". It simply takes our brain longer to process the words – and, as we all know, the internet reduces our attention span to that of an excited toddler in a toy shop.

Even the ordering of the numbers in a price can affect our perception of value, according to Jones. Numbers presented in descending order appear cheaper than those that ascend. "If you have something at \$567, we perceive that as considerably more expensive than \$543," said Jones, even though the proportional difference is small.

Tricks such as this can be used in a targeted way to push us towards choosing certain products. Given the choice between, say, two televisions on a website, most people will gravitate towards the cheapest. But if three options are presented "the one you actually want people to buy ends up as the middle option," observed Travis. It works for the same reason that an inexperienced

"The longer it takes to say the words of a price, the more expensive we think it is"



How Amazon knows what you want before you've even ordered it

Customer data can be an incredibly powerful tool for online stores seeking to maximise sales. Amazon is now so confident in its ability to predict customer behaviour from data that it's filed a patent for delivering items to customers before they've even ordered them.

Dubbed "Speculative Shipping", the idea is to minimise the frustration of postage delays and reduce the amount of time stock spends sitting in Amazon's warehouses. Let's say, for example, that you've pre-ordered the past three Call of Duty games from Amazon. Based on that history, the company can make a good guess that you're likely to be interested

in the next episode, and which console you'll want it for. If you've looked at the page for the forthcoming release six times in the past fortnight, that's probably a significant sign too. It all points towards the conclusion that if a chap arrives at your door at eight o'clock on the morning of release with a cardboard package in his hand, you'll gladly take it.

In practice, Amazon may not go as far as actually delivering a \$50 game on an educated hunch. The patent also describes scenarios in which such data is used to estimate demand for a product in a given area. If Amazon calculates that 30 people in your town are likely to order a best-selling

DVD in the week before Christmas, it can have them ready at a local distribution centre for next-day – or even same-day – delivery.

What if Amazon speculatively sends you something you don't want? Amazon's patent lays out several scenarios for enticing customers to take the goods, including the possibility of offering discounts while the package is in transit. Alternatively, "if a given customer is particularly valued (according to past ordering history, appealing demographic profile, and so on) delivering the package to the given customer as a promotional gift may be used to build goodwill". In other words, it's on the house!

wine buyer might choose an \$15 bottle of wine: they don't want to pay for the most expensive option, but they don't want to take a gamble on the cheapest either. By choosing which products to offer, the retailer can calibrate visitors' perceptions of value and steer them in the desired direction.

While all of these tactics take advantage of broad psychological tendencies, retailers also use experimental methods to find out the specifics of what pushes our buttons. For services such as online storage or software, where you might get "basic", "pro" or "enterprise" accounts, the differences between tiers are often presented in the form of a ticklist of features. Sites may experiment with different variations of the offer, to work out which features customers are most willing to pay for. Travis revealed how one client tested eight variations of a feature table on its site, and found that the winning variant produced an 185% uplift in conversions. "There was no way we could have worked out through psychology alone which of those benefits would have triggered those customers," she said. "But through testing, actually laying those things out in a table, we were able to see which one tipped them over."

SCARCITY SCARE TACTICS

If you've seen the "Black Friday" footage of grown adults scrapping in supermarkets to get their hands on the last of the cheap televisions, you'll appreciate that scarcity is a powerful trigger - and it's one that online retailers routinely exploit.

The little "only six left in stock" label Amazon often puts on items, or the "Hurry! Only four seats left at this price" alerts that pop up at flight booking sites, are designed to stimulate one of our base human instincts. "It taps into a fairly basic survival instinct in our brain," says Graham Jones. "If we go back through our evolution, we were much more interested in food when it was scarce than when it was plentiful. People don't like scarcity. They fear they're going to miss out."

Budget airlines play on this fear particularly aggressively: they tell you not only how few seats are available at a given price, but also how many other customers are searching for that flight at the same time (the truthfulness of those figures only they know, of course). Some even use cookies to put the price up should you return to search for the same flight a day later. In this way, even if they don't get your custom this time, they train you not to delay the next time you come looking for cheap flights.

Legally, online retailers aren't allowed to lie to customers about the remaining stock of a particular item, but there are ways to get around the rules: "Only five left at this price" is a common tactic, before the item is then instantly restocked at a marginally different price. Voucher codes for certain products that end on a specific date are another means of creating artificial scarcity: nobody wants to miss out on a bargain.

SITE LAYOUT & COLOURS

The psychology of online retail doesn't rely solely on deep-seated emotional triggers. It can also employ much more straightforward tactics, such as simply laying out the site in a way that encourages engagement.

Jones explained that, just as you know that baked beans are in the second aisle of your local branch of Coles, online shoppers expect the layout of a retail website to be instantly familiar. "Most people do most of their

shopping with the big retailers: Amazon, and so forth," he said. "All of those big online retailers will have their shopping cart's checkout button at the top right, and their search bar in the top middle. If you're a retailer that doesn't have your shopping cart on the top right, or your search bar top middle, then people won't know how to use your website. Many retailers lose out on sales because they're not doing what the big companies do."

That particular template hasn't become dominant by chance. "Here [in the Western world], where we read left to right, our brain sees the left-hand side as the past and the right-hand side as the future," explained Jones. "So if you want people to buy something, you're better off putting your 'Buy Now' button on the right-hand side of the page."

Believe it or not, the colour of that button is also critical. Jones cited research showing that red "Buy Now" buttons achieve better clickthrough rates than other colours, especially on sites targeted at men. "The reason is that red is a potent sexual signal," he claims, pointing to examples such as red lipstick and, further down the evolutionary chain, baboons' backsides. "Men are wired to be interested in things that are red." Red is less of a turn-on for women, which is why sites that appeal to a mixed audience (such as Amazon and Asos) use a more neutral orange colour for their buying buttons. It still has that reddish hue to appeal to the male shoppers, without putting off women.

Jones noted that many retailers make the mistake of using green buying buttons, because of the colour's association with "Go". Independently, though, two of our experts cited research indicating that green "Buy Now" buttons are less effective than red ones. "You can be quite relaxed about whether or not you obey the green traffic light," reasoned Jones. "You can't be relaxed about obeying the red one."

When it comes to more general use of colour, it seems there's no solid research establishing whether (for example) a blue site will in general perform better than a white one. However, there are certain colours that come preloaded with connotations - such as Jetstar's cleverly chosen orange branding. "In most western European countries, the colour orange is associated with cheapness," said Nahai, "and in the Netherlands, it's the national colour, so orange is seen as very positive."

THE POWER OF PHOTOGRAPHY

On the high street, shopping is a tactile experience: we brush our fingers over clothing, pick up objects and flick through books. Online shopping obviously lacks that first-hand dimension, so the most successful online stores bend over backwards to make shoppers feel as close to the products as possible. Amazon's Look Inside feature, for example, replicates that



"Scarcity is a very powerful trigger, and one that retailers routinely exploit"

“Red ‘Buy Now’ buttons achieve better clickthrough rates than other colours”

real-world experience of flicking through a paperback in a bookshop, checking out the size of the print and taking in whatever odd phrases and illustrations may catch the eye.

One of the most successful ways of simulating real-world shopping is by providing lots of high-resolution photos for would-be customers to pore over, so that they can zoom in and see the weave of that fabric, the texture on the laptop lid, or the grain on that coffee table.

“Product photography is about engaging the customer, replicating the product as if it were in their hands,” said Emma Travis. “One of our clients, Schuh, is particularly good at this. They take about eight photos per shoe, including the sole. This may sound silly, but it’s something that comes up quite a lot – people want to know the tread of a shoe, if it has good grip, whether it’s coloured. That kind of stuff really does help.”

Asos’s sales shot up by 20% after it introduced catwalk videos of models wearing garments, according to Nahai, because “people could imagine how it would look on themselves”. The Fits.me software – used by sites such as T M Lewin, Thomas Pink and Austin Reed – goes further, allowing shoppers to enter their vital statistics and see exactly how a selected garment would fit them. The software removes the inconvenience and potential embarrassment of going to the shop to try stuff on – and the company claims it’s cut size-related returns by 77%.

SEALING THE DEAL

Even after a retailer has persuaded you to fill up your shopping basket, the battle isn’t won. The Baymard Institute, which provides analytics for e-commerce sites, claims that almost seven out of ten items added to an online basket are never actually paid for. Retailers therefore need to do everything they can to get you to complete your purchase.

One way in which they do this is to borrow a trick from theme parks. Just as Disneyland doesn’t let you see the full length of the queue for a ride, the sharper online stores break up their checkout procedures into four or five shorter sections, so that you aren’t put off by a lengthy looking form to fill in. Travis labels this the “momentum effect”. “It creates the illusion of progress, because people feel like they’re getting somewhere, that they’ve finished one page and are moving on to the next,” she explained. Between them, those four or five pages might have exactly the same number of fields to fill in as a site with one long page, but because the next ten questions are hidden, you aren’t discouraged by seeing how far you are from the end of the process.

Another way online stores seek to minimise abandoned purchases is through constant reassurance as the customer makes their way through the checkout process. A progress bar telling a customer they have reached, say, stage three of five gives them a sense of

achievement, almost turning the checkout into a mini-game that the customer wants to complete.

CHECKOUT

“Another thing we’ve found to be very effective at increasing completion rates is, each time someone fills in a field – say their name, address or whatever – you add a green tick once they’ve finished it,” said Nahai. “That’s a very simple, subtle hack that gives people a sense of being rewarded.”

It seems you really are very easy to please. And now you’ve completed reading this feature. Well done. ■

How to get your own back

DEMAND THE DIFFERENCE IF THE PRICE DROPS

Retailers such as Amazon might fiddle with the price of a product several times a day to ensure they’re never undercut by rivals. This means you can miss out on a discount in the time it takes for the product to be shipped, especially on expensive electronics. Remember that stores generally give you a 14-day cooling-off period to return goods bought from any online store, and Amazon in particular gives you 30 days to return unused items. Use this to your advantage: contact customer services and threaten to return the goods unless they refund the difference between what you paid and the new price. There’s a good chance the retailer will acquiesce, because they don’t want the hassle and expense of handling returns.

DON’T TRUST SITE SEARCH ENGINES

If you want to find a specific product on a retail site, don’t use the site’s own search engine. An expert who wishes to remain unnamed told us that some sites remove special offers or discounts from products when the customer searches specifically for them, on the basis that those customers are already interested in the product and therefore don’t need extra encouragement. You may get a better deal by searching the site through Google or another search engine.

LET ITEMS LANGUISH IN YOUR CART

Since so many online purchases are abandoned at the shopping cart, retailers will sometimes offer you an extra incentive to close the deal. If you’re in no hurry, try adding an item to your basket, then waiting a couple of days before checking out. The store may email you a reminder that the item is still in your basket – often with a discount voucher to encourage you to complete the transaction.

RUN YOUR OWN AMAZON PRICE TRACKER

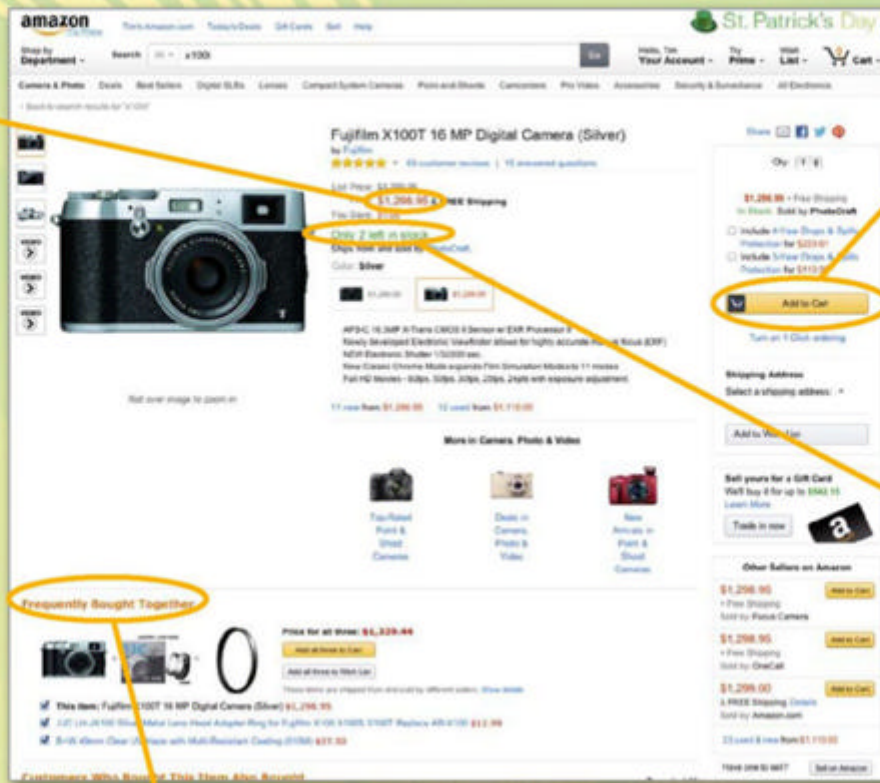
It would be a full-time job to try to keep track of all the prices on Amazon, but there are tools available that can do it for you.

The camelcamelcamel.com website can send you alerts via Twitter or email if a price of a selected item drops below a certain threshold. Or, if you have several items on your Amazon wishlist, you can create an unofficial price-tracking spreadsheet in Google Docs to get a daily email alert if a price changes. The template is available to download at tinyurl.com/kvvyvaq.

Amazon

Shoppers are wise to the trick of ending prices in .95 to make them appear a dollar cheaper than they really are. But knocking off only a few more cents can still make the item appear more of a bargain.

The English language reads from the left (the past) to the right (the future). Amazon places its buying buttons at the right because that's what it wants you to do next.



Shoppers, especially men, are attracted to the colour red – a “potent sexual signal” in nature, according to psychologist Graham Jones. Amazon’s “Add to Basket” button is a yellow/orange colour, but the button they really want you to press, “Buy Now”, is closer to red.

Many online retailers play on the fear of scarcity. By revealing that it has only a limited stock of an item, Amazon is tapping into the basic human desire not to go hungry.

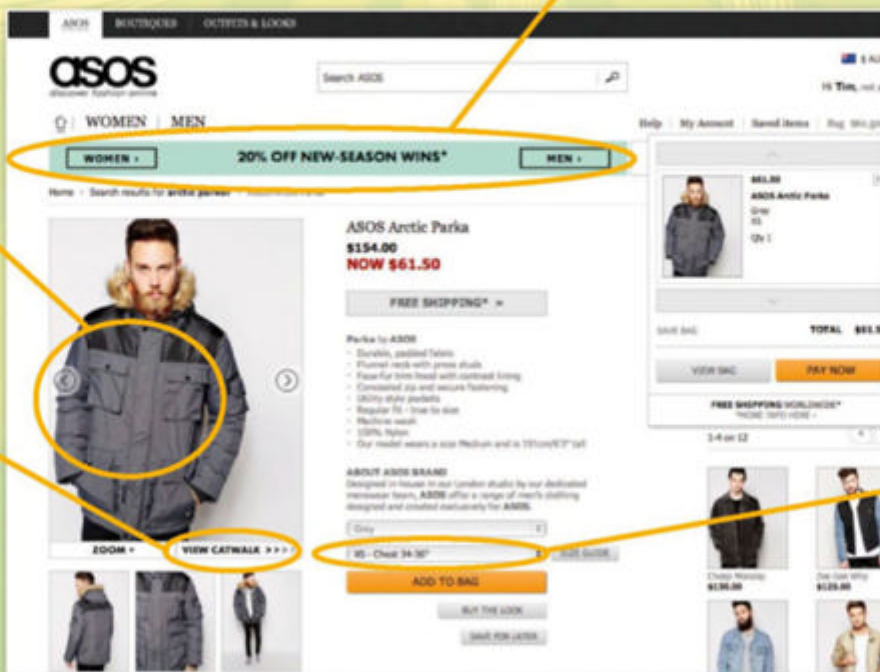
Amazon uses social proof – the opinions of “people like you” – to try to sell you more products, even items (such as the tablet and the DVD) that are completely unrelated to the item you’re currently considering purchasing.

The “FINAL REDUCTIONS” offer, highlighted in a colour that contrasts starkly with the rest of the site, draws the shopper’s eye and underlines the sense of value.

ASOS

Each of the four photos of the jacket is zoomable, allowing customers to see the texture of the fabric close-up, getting as close to the store shopping experience as possible.

Asos provides a catwalk video for every garment it sells. “Shopping is a visual medium,” said Nathalie Nahai. The video “increases familiarity and the sense of trust” in the product.

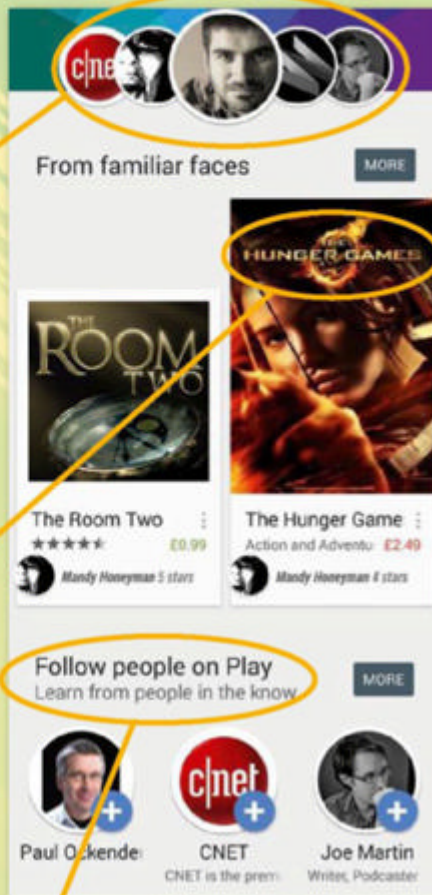


The website also allows you to enter the measurements of your existing clothes, so you can see how the fit will compare with the item you’re thinking about buying. Again, it’s about increasing trust in the purchase, as well as helping to reduce the crippling returns rates suffered by many clothes retailers.

Google Play

The Google Play homepage plays strongly on the influence of your peers, picturing you at the centre of your friends and associates, and displaying their personalised recommendations below.

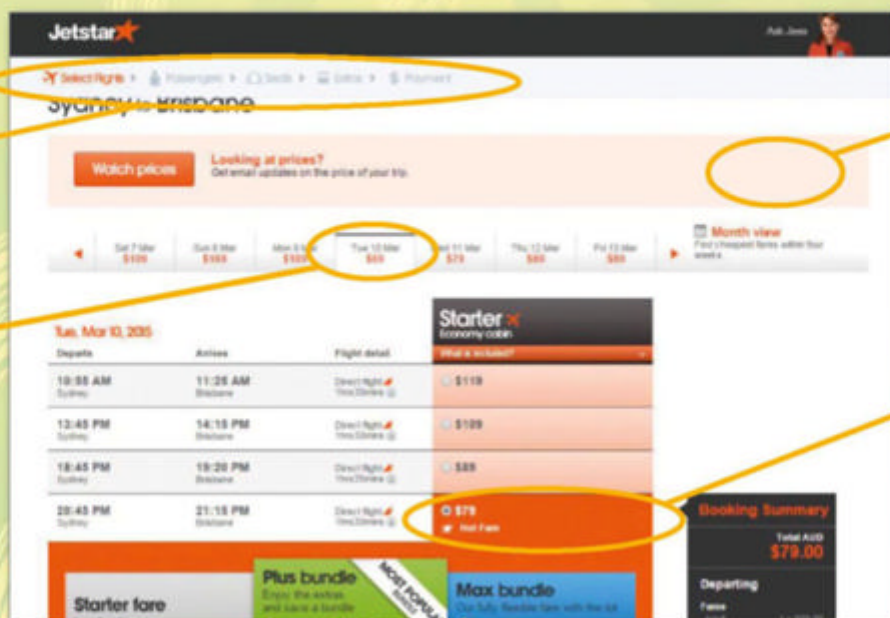
The ultimate social proof comes from a known associate. Note that the more expensive of the two recommendations has its price in red, while the cheaper item is priced in green – red being the colour that the male eye is drawn to immediately.



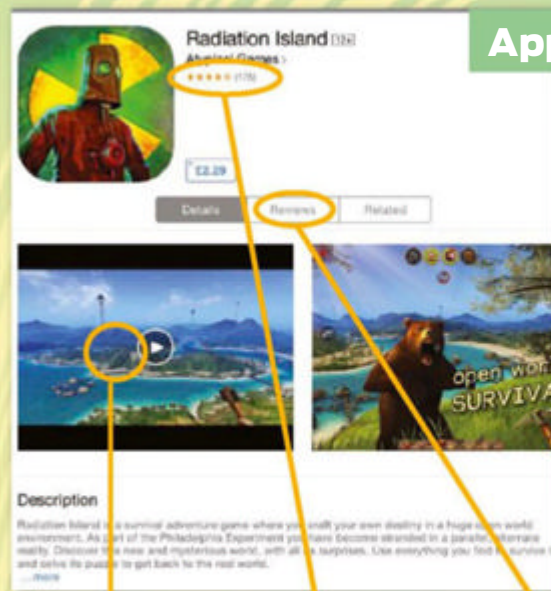
Emma Travis from retail consultant PRWD told us that there are three key factors influencing buying decisions: personalisation, emotion and trust. Offering recommendations from friends provides personalisation; the "learn from people in the know" line is designed to assert authority and foster trust.

Jetstar breaks down the booking process into several small steps rather than one long form. This makes it seem less laborious than it really is, and provides a sense of progress.

The price of the desired journey is presented between more expensive options. People will often choose the one in the middle because their perception of value has been anchored by the surrounding more expensive items.



Apple



Introduced relatively recently to the App Store, the video previews are another potent sales tool. In the same way catwalk videos help people to imagine what clothes would look like on them, the videos help potential buyers get a better feel for the game.

Apple makes heavy use of social proof in the App Store charts. Not only are these apps already popular with other iPad owners by definition, but each has a star rating attached to reinforce the recommendation. Once selected, the app's rating is also featured prominently.

You can't see it here, but the Reviews tab hammers home the social proof, this time inviting you to "be the first of your friends to like this" on Facebook at the very top of the page. Not only is it playing on your desire to seem ahead of the curve, it's relying on the strongest recommendation of all – friends and family – to sell more copies of the app.

Jetstar

Orange is Jetstar's corporate colour and one that has become associated with "cheapness", according to web psychologist Nathalie Nahai.

Jetstar is cranking up the fear of missing out, urging buyers to buy the 'Hot Fare' even though there will almost certainly be more seats available for similar prices.

THE GREAT EASTER EGG HUNT

EVEN THE MOST PO-FACED SOFTWARE PRODUCTS MAY CONTAIN AN IN-JOKE, GAME OR MOMENT OF MADNESS. **STUART TURTON** SEEKS OUT SOFTWARE'S SILLIER SIDE

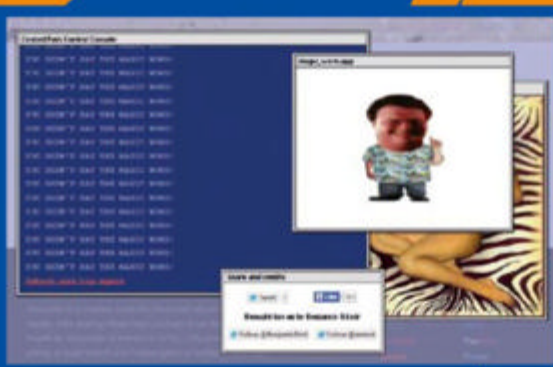
In 1979, Warren Robinett snuck a secret message to fans in his Atari video game, *Adventure*. Players were soon scurrying through every corner of the game world to locate Robinett's hidden message, the staff at Atari likening the madness to an Easter egg hunt. The term held, as did the practice, with jokes, snide references and strange commands ending up tucked away into thousands of products. Join us as we explore the strange corners of the software you use every day.

ZOMBIE ANDROID

The different versions of Android have always been named after tasty treats, including Gingerbread, Ice Cream Sandwich, Jelly Bean, KitKat and, most recently, Lollipop. Each of these has come with its own Easter egg, accessed by entering Settings | About Phone (or Tablet) and then repeatedly clicking on the Version tab until the magic happens. The subsequent animations have run the gamut from surreal to downright disturbing, although a favourite has to be Gingerbread, which brought up a painting of the Android logo holding hands with a gingerbread man, while surrounded by zombies on smartphones.

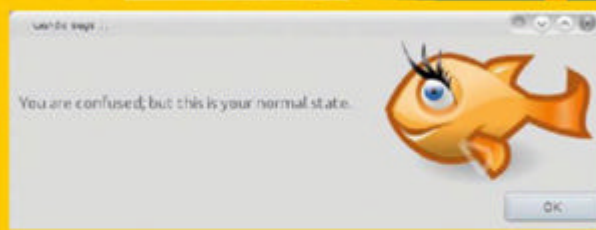
404

404 is the error code you receive when a web page is down, or you've typed an address wrong. In most cases, such errors are irritating, but a few companies have made their 404s so good that we'd happily set the North Koreans on them, allegedly, just to see the messages more often. Our favourite can be found at nouvelle.com/404 - which recreates the famous sequence from Jurassic Park, where tubby hacker Dennis Nedry lets the dinos loose. Don't forget to enter the magic word. A close second is the 404 for the NPR website (tinyurl.com/yeobyqy), which simply lists other missing things, from Atlantis to Wally, to your luggage.



▲ Fans of Jurassic Park don't need us to explain what inspired this brilliant 404 error page

LINUX FREES THE FISH



▲ Not only will Linux free your fish, it can also dispense helpful advice about your state of mind

Linux is the work of a million mad geniuses, which means Easter eggs are stuffed into every coded crevice. Start messing about in the terminal and jokes tumble out like clowns spilling free of an exploding car. Start with Alt+F2, and then type "free the fish" to release Wanda the goldfish onto the desktop. Aside from being a rather jolly presence, Wanda also dispenses snippets of fortune-cookie wisdom such as "You are confused; but this is your normal state". Equally wonderful are the various calendars, accessible through the terminal by typing "`ls /usr/share/calendar/`". Among our favourites is the Lord of the Rings calendar, which marks the progress of the ring-bearer and his pals as they travel halfway around the world to stop Sauron getting married. Disclaimer: we may have taken the wrong message from that book.

SILLY OLD SKYPE

Not all of Skype's emoticons can be found behind that sinister, ever-smiling face to the right of the instant-messaging box. Typing commands such as (moon), (drunk), (swear), (smoking) and (poolparty) can bring a great deal more... colour to your conversations.

GEEKS R GOOGLE

One day, Google employees will be just brains in jars, wired directly to the internet, so we should all enjoy their capacity to feel human emotion while we can. As the delivery service for popular culture, it's no surprise to see Google's gaze encompass perhaps the geekiest of all sci-fi shows, Doctor Who. Head to Earls Court in Google Maps (tinyurl.com/oy6kq6n) and you'll notice a police box sitting outside the Tube station. Hit the white "X" that appears in front of it and you'll be ushered into the Tardis.

Speaking of things that are rarely right side up, searching for "askew" will knock the page sideways, while typing "do a barrel roll" spins the page 360 degrees – a feature worth trying out on a colleague who's looking the worse for wear. Should that fail, type "zerg rush" – a term borrowed from Blizzard's StarCraft video game – which invites a swarm of zeroes onto the screen to start devouring your search results. Click the zeroes to score points.

But this is just the start, with hundreds of Easter eggs tucked away in Google products. Indeed, Wikipedia has a curated list of the best (tinyurl.com/plbwouh), many of which have a hint of melancholy. Search for "loneliest number", for instance. Perhaps Googlers sense their time in the is coming.

✓ Doctor Who fans can step back in time to visit the Tardis circa 2012, simply by heading to Earls Court in Google Maps



jar



APPLE BITES

Whereas Google's Easter eggs revel in popular culture, Apple's Easter eggs revel in Apple culture – a fact that will surprise nobody. For example, the icon for the TextEdit application is a pen and notepad with something written on it. If you pull up the icon in Finder, you'll discover it's the "Here's to the crazy ones" speech narrated by Richard Dreyfuss in Apple's 1997 ad campaign, which subtly suggested that if Albert Einstein and Gandhi had been alive they'd have used Macs, and possibly worn black polo necks, and probably worked in Apple's marketing department.

Among the user-avatar icons is a picture of a record with the words "magic, revolution, boom" and "unbelievable" printed on it. These were the words Steve Jobs used most frequently during keynote addresses, and probably while making omelettes at home: "I'm just adding a little cheese to the top, BOOM, unbelievable. Look at how crisp that is, isn't it beautiful? I've revolutionised the omelette."

He'd usually go on to sledge Microsoft, so thankfully there's a little tribute to that in OS X as well. If your Mac discovers a PC on the shared network, it will display a 1990s-looking computer with Microsoft's "Blue Screen of Death" error message on the display. Thankfully, Apple found the ideal expression of this curt, clipped superiority in Siri, its personal assistant. Say "OK Glass" to Siri – the command for launching Google Glass – and you'll receive one of six irate responses, including "Very funny. I mean, not funny 'ha-ha', but funny", "I think that Glass is half-empty", "Stop trying to strap me to your forehead. It won't work", and "Just so you know, I don't do anything when you blink at me."

If you're not in the mood to hear what Siri's thinking, head to the Terminal in OS X, type "emacs" and hit Enter, then press Esc+X. Then enter "psychoanalyze-pinhead" and watch as your Mac turns its Freudian gaze upon itself.

WHO UPSET MOZILLA?

Firefox is the little browser that could, then did, and then couldn't work out what to do next. Built as the anti-Internet Explorer, it championed openness, speed and not being rubbish, and set the standard for all of those things until Chrome came along and stuck a massive multicoloured flag in the internet.

The history of this struggle is told through a sinister Easter egg buried within the browser. Type "about:about" into the address bar and select "about:mozilla". You'll be presented with the phrase "Mammon slept. And the beast reborn spread over the earth and its numbers grew legion. And they proclaimed the times and sacrificed crops unto the fire, with the cunning of foxes. And they built a new world in their own image as promised by the sacred words, and spoke of the beast with their children. Mammon awoke, and lo! It was naught but a follower. From The Book of Mozilla, 11:9."

Although it sounds like something you'd find scrawled on the wall of a serial killer's shed, the page reference refers to an important milestone in the company's history, with the quotes updated whenever there's a new release. After you've fled the "about:mozilla" page, stop by the "about:robots" page for a crash course in geeky robot references.

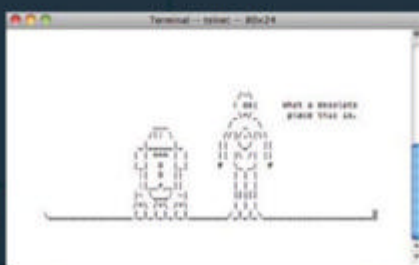


ADOBE ATTACKS

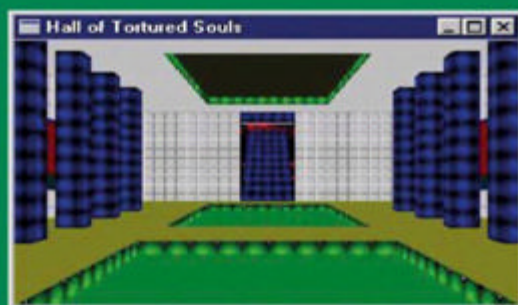
Think Adobe and you're quite likely to think industry-behemoth-that-has-come-to-take-over-the-world, so it's perhaps surprising to learn that behind that serious façade lies a jolly heart, expressed in half a dozen genuinely amusing Easter eggs. Among them is InDesign's friendly alien, who will turn up if you wade into the File menu, select Print Presets and click "Define...". Create a new Print Preset and call it "Friendly Alien", then save it. Now open a blank document and go to File | Print, and change the print preset at the top of the dialog box to Friendly Alien. Click the large P in the Print Preview window in the dialog box. You'll receive a visit from the alien, whose smiling face should be enough to dispel the despair instilled by InDesign's print options. If that's not helping to lift your mood, pop over to Muse, and place an Anchor on the design canvas. Copy and paste this snowman character (available from the Muse Facebook page at tinyurl.com/k9a9n69) into the anchor name and it will start snowing.

TERMINAL STRIKES BACK

Ever thought the problem with Star Wars was the special effects, actors, colours, movement, sound effects and, you know, visual elements? Well head over to the terminal in Linux or OS X, type in "telnet towel.blinkenlights.nl" and hit Enter. Witness the glory that is Star Wars in ASCII art. Windows owners can enjoy this foolishness, too, but if you're running Windows 7 or later, it will require a little fiddling to get going. The internet is your friend on this one.



> It's a shame Microsoft has stopped creating Easter eggs, because some of them were instant classics – such as this Doom-like game hidden in Excel 95



ESCAPE FROM MICROSOFT

If a psychiatrist had examined the Easter eggs in Microsoft's products throughout the 1990s, they'd have stormed Redmond and demanded Bill Gates release the programmers he surely had chained up in the basement. Each one is a little cry for help, none more so than the "Hall of Tortured Souls" in Excel 95. This Doom-like mini-game dropped players into a maze decorated with the names and faces of the Excel team. Thankfully, the graphics of the day couldn't convey the screaming, visceral horror of their imprisonment, so instead we got a maze designed by demented Teletubbies. Excel 97 swapped out the inescapable maze for a flight simulator (a cry for freedom if ever we heard it), and then a racing game in Excel 2000 (help us, we're going nowhere fast). These quiet pleas by the programmers were snuffed out in 2002, when Microsoft launched its Trustworthy Computing initiative, which promised nothing unexpected would find its way into your software – except for bugs, disappointment, bad ideas and sudden U-turns. Good to know where we all stand. ●

YOUR CHAIR

EVIDENCE SUGGESTS THAT SITTING DOWN ALL DAY MAKES YOU UNPRODUCTIVE AND UNHEALTHY. **JOEL SNAPE**, ACTING EDITOR OF MEN'S FITNESS, HELPS YOU INTRODUCE MOVEMENT TO YOUR DAY

Are you sitting comfortably? Then you should probably get up and walk around a bit. Scare stories that draw a parallel between the ill effects of sitting and smoking may be overstating the case a little, but not by as much as you'd think. After all, while you can give up tobacco, it's a lot tougher to renounce your workstation or find the e-cigarette equivalent of a chaise longue. Since most modern jobs involve hours of sitting down,

the obvious questions are: what's causing the damage? And what can you do about it?

One problem is what researchers call non-exercise activity thermogenesis (NEAT). The more you sit, the lower your NEAT, the fewer calories you burn: 1.36 calories per minute fewer, according to studies.

According to Dr James Levine, author of *Get up! Why Your Chair is Killing You and What You Can Do About It*, low NEAT is linked to weight gain, diabetes, heart attacks and

cancer, and standing up for even a few extra hours a day can make a difference.

Exercise can help with the calorie expenditure part, of course, but an hour or so a day isn't enough. Why? Put simply, because sitting down puts your body on standby. When you do this for any length of time, your circulation becomes constricted, your metabolism slows, and your connective tissues tighten.

"This causes your hip flexors - the muscles on the front of your thighs - and your hamstrings to contract or shorten," says Dr John Tanner, a musculoskeletal expert and osteopath. "Your buttock muscles are also constantly stretched with your knees at a 90-degree angle, which leads to muscles and

6'0"

5'6"

5'0"

4'6"

4'0"

3'6"

3'0"



SKILLING YOU

FIGHT BACK

joints tightening so much that your body moves less freely, decreasing agility and making you more prone to injury."

All this results in placing stress on your lumbar spine, leading to lower-back pain that's responsible for an estimated 4.5 million days off work in Britain each year.

Sitting for extended periods has also been linked to increased waist size and risk of a host of cardiovascular diseases, even among otherwise active individuals. The problem, it seems, is "uninterrupted sedentary time".

And as if spending nine hours a day sitting in a chair weren't bad enough, PC slouch is arguably even worse - whether you're tapping numbers into Excel or playing Eve Online, working at a desk exacerbates

the tendency to round your shoulders forward, squint your eyes and tense your facial muscles.

Movie-goers' knee - the chronic joint pain that comes from prolonged contact between the femur and patella (whether it comes from sitting in a multiplex or at home)

"SITTING FOR EXTENDED PERIODS HAS BEEN LINKED TO INCREASED WAIST SIZE AND CARDIOVASCULAR DISEASE"

- is also a recognised medical

problem, and even an hour of sitting down can make your back measurably tighter, as it tries to compensate for everything else.

So what's the solution? Exercise alone, as mentioned earlier, won't cut it. Yes, it helps with the NEAT part, reduces your chances of obesity-related problems and has protective effects against everything from osteoporosis to Alzheimer's - but it won't fix the mobility issues or long-term effects of sedentary times.

For those of you under the



HOW TO KICK THE SITTING HABIT

SET A TIMER

According to research conducted by The New York Times correspondent Gretchen Reynolds, "new science shows very persuasively that standing up about every 20 minutes, even for only a minute or two, reduces your risk of developing diabetes and heart disease."

WALK AND TALK

Dozens of companies now have walk-and-talk - or at the very least stand-and-talk - meetings. If your place of work is unconvinced, point out that successful companies such as HR firm Salo have their own walking tracks, or that top telesales people stand to make calls because it makes them more dynamic and creative.

GET A STANDING DESK

Decent ones start in the \$600 range - not too much of a stretch if you can make the case that it will make you more productive. Introduce standing-time slowly; maybe do it while you check emails, or do other non-creative but necessary tasks. Need to "blue sky" a solution or multitask? Feel free to slump in your chair.

TRACK YOUR ACTIVITY

Almost any fitness tracker - and a slew of phone apps - will count the steps you take every day, and a host of studies suggest that 10,000 is the magic number for a variety of health benefits. Having metrics to improve on can help, especially if you're able to plan meetings across a variety of locations, or just get away from your desk for ten minutes at a time.

THE ANTI-CHAIR WORKOUT

Don't get up – you can fend off some of the worst effects of sitting while still deskbound, if you take some advice from MobilityWOD founder **Kelly Starrett**

INTERNAL HIP ROTATION

Cross one shin over the other thigh and try to pull that leg across your body, while leaving your other foot flat on the floor.



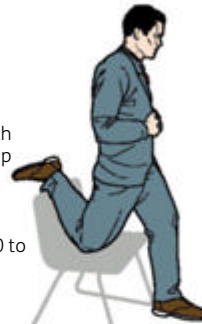
SEATED HIP FLEXION

Rest your right foot on your left thigh to make a seated figure-four. Next, keeping your back straight, bend forward at the hips, feeling the stretch in your hip.



CHAIR HIP EXTENSION

Put your knee on the seat of your chair with your shin extended up the back. Lean gently back until you feel a stretch in your quad, and hold for 30 to 60 seconds.



THE TWO-MINUTE POSTURE FIX

It isn't only your legs that need to move. Counteract the office slump with this three-move workout, created by trainer **Jessica Wolny** (jessicawolny.com)

BATWING

Standing roughly 30cm from a wall, lean back against it, bracing yourself so that your body is straight. Now, keeping your thumbs in your armpits, push yourself away from the wall using your elbows, and hold for 10 to 15 seconds. Repeat a total of three times.



CHEST STRETCH

Interlink your fingers behind your back and raise your arms, pushing your chest forward while keeping your back straight. Hold for 30 seconds.



S-REACH

Try to link your arms together behind your back - one up, one down. If you can't reach, use a small towel or something similar to hold the stretch. Do this for 30 seconds on each side.



impression that swapping that chair out for an exercise ball will solve these issues, think again. Studies show that muscular activation is largely the same whether you're sitting on a ball or a chair, and the greater contact area can actually lead to more soft-tissue compression and spinal shrinkage, as well as more stiffening in the upper back and neck.

Studies of kneeling chairs, meanwhile, remain inconclusive; they tend to focus on postural comparisons rather than muscle activation, so it's difficult to draw any firm conclusions.

Of more benefit would be to stand up. At least one study suggests that computer users who stand up for an hour during their workday have less back pain. Standing up has also been linked to reduced risk of cardiovascular disease and can help regulate your body's glucose supplies, which helps you use up energy from food more efficiently and can lower your risk of type 2 diabetes. There's even evidence standing can reduce the risk of developing certain cancers.

But there's another issue to consider: how much work you actually get done. Standing up or even strolling around might be fine if your job isn't all that cognitively challenging - or if you're just "researching" on Reddit, for instance - but how does it work if you're

"THOSE WHO REGULARLY STAND THROUGHOUT THE DAY REPORT THAT IT MAKES THEM FEEL MORE ENERGETIC"

involved in intricate decision-making?

In general, research suggests little difference between sitting and standing. The exception comes in cases of more complicated multitasking, where sitting is apparently better. Walking is a different matter entirely: study participants invariably end up stopping when they need to work on complex tasks. In both cases, however, researchers noted that there's a chance that performance would improve with time and experience.

A better option is to move around in between bouts of work. Those who regularly stand throughout the day report that it makes them feel more energetic, while research suggests that cognitive performance increases in those who make exercise part of their daily routine. This isn't

restricted to middle management - a slew of writers, from Ernest Hemingway to Vladimir Nabokov, did most of their work while standing. So, assuming you're not a Pulitzer-prize-winning novelist, how can you get more standing into your life? Going straight from endless sitting to non-stop standing isn't recommended - it will feel like torment, and

isn't likely to be good for your productivity. Small, incremental changes are key: just moving from your desk to the office kitchen a bit more at first, taking phone calls while standing up, or even instituting walking meetings can help.

Another solution is to invest in an adjustable-height desk; converts swear by them. Expensive versions come with an electric motor, while cheaper units offer adjustments via hand-crank. Most experts recommend starting out with a 1:1 sit/stand ratio, adjusted as you get used to the new experience - you can do it by task, or time.

To get started, refer to the short exercises above. None of them involve fitness clothing or getting sweaty. You may get a few odd looks, but show doubters this article and get them exercising too! ●

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IN THE LABS

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Costing concerns

BEN MANSILL WONDERES IF THE PRICE IS RIGHT

A word or two on pricing, to kick things off. The last time we ran a CPU roundup I recieved a few letters from *PC&TA* readers pointing a few errors in our \$ numbers. That they couldn't find the same CPU for sale at the same price that we'd published, being the issue. Most were kind, but one bloke was really angry because the difference was \$4.

Well, I can assuredly say with reasonable confidence that most if not all of the prices we have quoted will probably be wrong within a month! But I'm sure most of you won't be surprised to hear that. CPU prices fluctuate like crazy. You won't find any that stick by Intel or AMD's RRP, or probably even find the same CPU at the same price at two different shops. This is all compounded right about now by the downwardly yo-yoing (now there's a word that never looks right when written :)) Aussie dollar.

It all actually extends right across the computer market, as we see in this month's Kitlog. Across the board, the cost of PC

components and peripherals has risen steeply - in some case by as much as 20-30%. And that's all in the space of just a couple of months. It's alarming, alright, and serves as quite the reminder that resellers operate on miniscule margins, and with little capacity to absorb any rises for very long.

On the bright side, once (if) the dollar regains strength prices should drop again fairly quickly. For the record, we use staticice.com.au to search for product prices and take an average in most cases, as it gives a very accurate 'street price'. For roundups like this issue's CPU feature, relative consistency between the products is paramount, as there are so many, so generally we look to pricing on the PC Case Gear site. That particular reseller has a comprehensive stock list, and they are on top of the game for pricing that is both a fair representation of the market, and they update frequently. That way, when we have as many products as we do with the CPU feature (63!) we're able to print prices



that scale across the range properly in proportion to each other.

Anyway, it all matters little at the cheap end of town. A 3.8GHz AMD FM2 A4 4000 CPU can be had for less than \$40. For a media build, or basic machine that's peanuts. At the other end of the scale is Intel's eight-core i7 5960X, selling for just under \$1420 at the moment.

It's such a span that it reinforces the need for a comprehensive group test. This issue is a keeper, I reckon. Keep it around, because even in a year or more it will serve well as a quick look up table to know the CPU landscape, and what each chip can do. Because, who can remember all this stuff? Well, perhaps the chaps in the Lab.



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WHAT OUR A-LIST MEANS

Our A-List award is reserved for the best products in each category we review. With a winner and an alternative pick in each, that's 92 products you know are first class.



WHAT OUR AWARDS MEAN

PC & Tech Authority's comprehensive Real World testing sorts out the best products from the pack. Any product recommended by *PC & Tech Authority* is well above average for features, value for money and performance.



WHAT OUR RATINGS MEAN



HOW WE TEST

Our benchmarking tests are the best in the business. Read on to find how they work...

2D TESTS

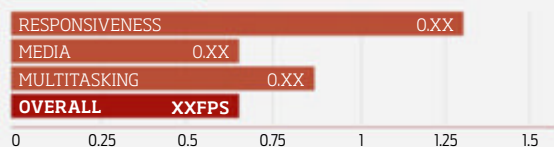
We test desktop PCs, netbooks and laptops with our own, custom-built, 2011 Real World Benchmarks.

We split the results into three categories: Responsiveness, Media and Multitasking, with the Overall score an average of the three sub-scores.

For instance, responsiveness replicates light browser and productivity workloads. The Media test involves running iTunes for audio conversion, Photoshop CS5 to crunch large images and Sony Vegas 10 to edit home video. This then gets run simultaneously alongside Cinebench 11 in order to get a handle on the multitasking ability of the system.

BENCHMARKS

3.4GHz Intel Core i7-2600K, 4GB DDR3 = 1



3D TESTS

We use pre-recorded demos in Crysis and DIRT 3 to test gaming performance where relevant. We have three standard test settings, depending on the power of the graphics card: Low, Medium and High.

To test gaming performance, we use our own recorded Crysis benchmark. We use the Low, Medium and High quality settings in 1366 x 768, 1600 x 900 and 1920 x 1080 screen modes respectively. Very high-end systems can also be tested using the ultra-intensive Very High settings, with all detail switched on, and varying levels of anti-aliasing enabled.

3D SPEED

GOOD PLAYABLE UNPLAYABLE



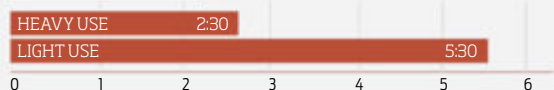
LAPTOP BATTERY LIFE

We subject laptops to two battery tests. In the light-use test, we optimise the system settings for the greatest power efficiency. We then disconnect the mains and run a script scrolling a selection of web pages until the system shuts down, giving you a realistic idea of the surfing time each laptop offers.

For the heavy-use test, we engage Windows' High Performance power profile, set the display brightness to maximum, and allow the taxing Cinebench 3D renderer to push the processor load to the limit. This gives a worst-case figure, revealing how long you can expect the battery to last under the most demanding conditions.

BATTERY LIFE

HOURS:MINUTES



REVIEWS



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Windows 10 Technical Preview for phones

MICROSOFT KICKS OFF THE EVOLUTION OF ITS MOBILE OS WITH A HOST OF SUBTLE YET SIGNIFICANT CHANGES

At the end of last year, Microsoft unveiled its vision for the future of Windows: not only the desktop, but also on smartphones, tablets and other connected devices. Until now we've only been able to get a feel for Windows 10 on the desktop – what's changed is that the next piece of the puzzle has been made available: Windows 10 for phones.

Just like the desktop OS, the smartphone version is a Technical Preview, available to anyone with a compatible Windows Phone 8.1 handset who registers with the Windows Insider Programme. We've installed it on a Nokia Lumia 630, but you can also try it out on the compatible phones listed above.

SO WHAT'S NEW?

At first glance, you'd be forgiven for wondering what all the fuss is about. The lockscreen and homescreen look largely as they did in Windows Phone 8.1, and that's a good thing. After all, Windows Phone's biggest strength, and what sets it apart from Android and iOS, has always been its vertically scrolling, data-rich Live Tiles.

It doesn't take much digging before the changes begin to emerge, and the most profound are to be found in the Action

Center notifications menu.

The first time you look, you'll see the same four toggle buttons along the top of the menu, with notifications lined up beneath. Look closer, though, and you'll see some subtle alterations.

The All Settings shortcut has disappeared, to be replaced by Expand. Tap this and the single row of shortcut buttons grows to three rows, allowing quick access to all 11 of Windows Phone's available shortcuts. It's still possible to customise the four that appear by default, but you can't currently remove or add items to the expanded list.

Below the shortcut buttons, notifications have also received an upgrade, but this is far more significant. To the right of each notification now sits a small down arrow. Tapping this expands items, allowing you to either read more or interact with them. Currently, the range of apps that hook into this capability is limited: you can respond directly to text messages, but not emails.

This also applies to the pop-down alerts that appear at the top of the screen, although it's fiddly at the moment: you need to tap a thin bar below the notification; swiping down doesn't work. Hopefully, Microsoft will have addressed this by the time the software is finally released. Tuck the notifications menu away for a moment, and you may also notice a tweak or two to the look of the homescreen. Background wallpapers that were previously displayed rather oddly – only through individual tiles, as if they were windows onto the image behind – now fill the entire screen. And some tiles, such as those for Outlook and Internet Explorer, are now translucent.

There are a couple of new tile sizes as well: a 4x4 square and a 2x4 rectangle, although currently only a few apps are compatible with these sizes. Swipe right to Windows Phone's alphabetical list of apps, meanwhile, and you'll see a list of recently installed apps conveniently displayed in a group at the top of the list for easy access.

UNIFIED LOOK AND FEEL

With Microsoft even merging the names of the desktop and mobile operating

◀ The shortcut buttons in the Action Center can be expanded to show 11 items

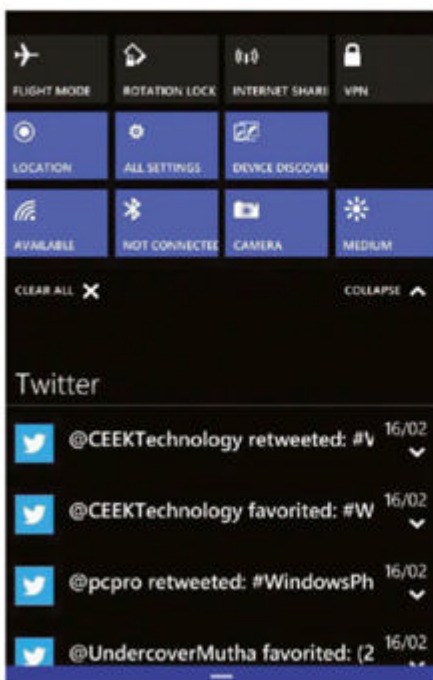


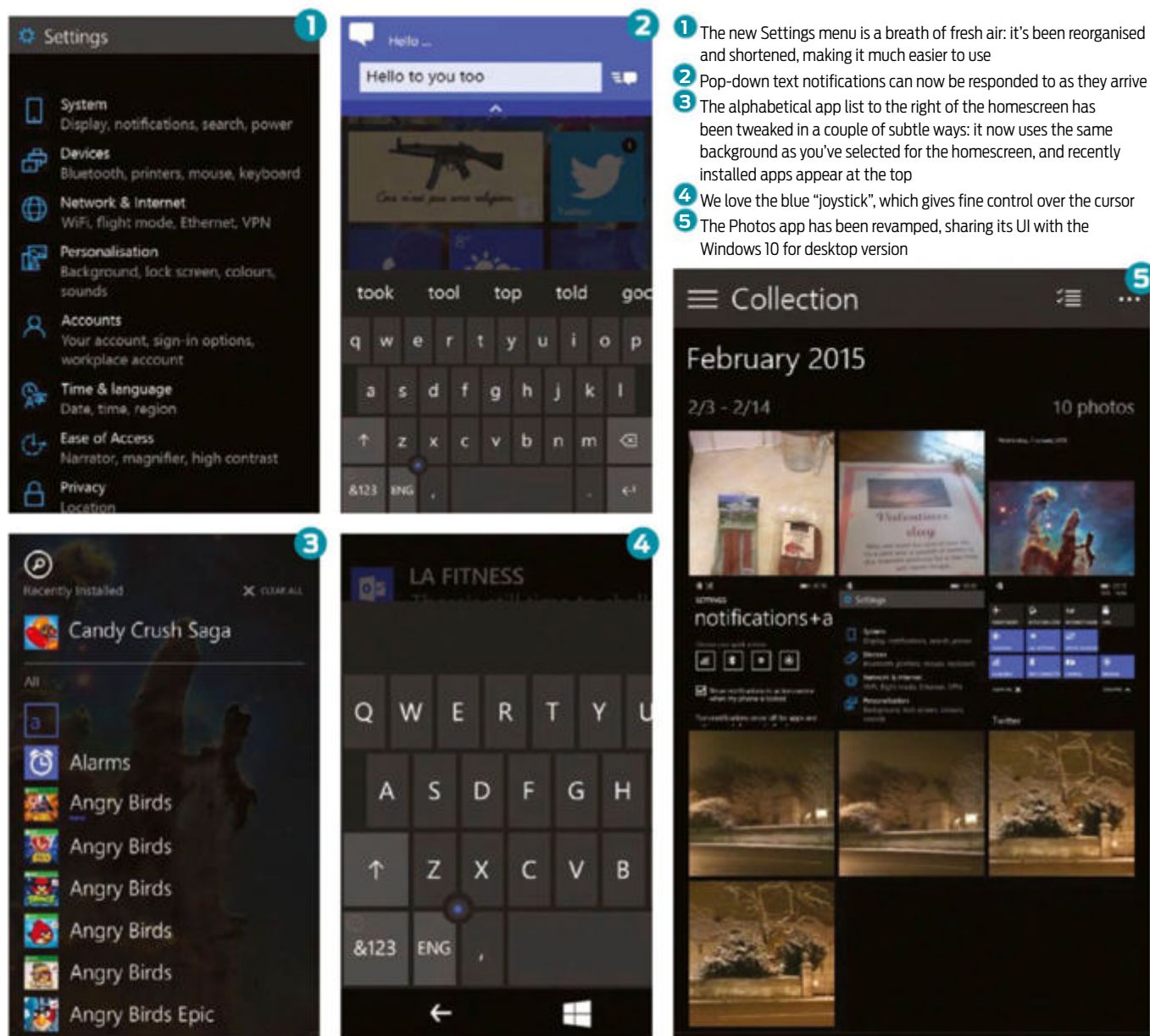
“The eventual aim is to unify both platforms and have developers produce universal apps that share the UI and feature set”

systems, the eventual aim is to unify the two platforms so that there's consistency across them. Equally crucial, developers will be able to produce universal apps that share the UI and feature set across the two platforms as well.

The work isn't complete, but you can see where Microsoft is going with this. In the Settings menu, each entry is now accompanied by the same wireframe icon as used on the desktop version of Windows 10, plus fonts match too.

Microsoft has also rationalised and organised the list of items in the Settings menu. In Windows Phone 8.1, you'll find no fewer than 50 items in a vertically scrolling list, arranged in no kind of order; in Windows 10 for phones, these items are organised into ten thought-through categories, under titles such as Network & Wireless, Accounts, and Time & Language. As a result, it's much easier to find what you're looking for.





The redesign of some core apps is another indicator of how the design of Windows Phone is set to change this year. The Photos app, for instance, already shares the layout and UI of the Modern app on Windows 10 for desktop.

Perhaps more significantly, it also does away with Windows Phone's characteristic sideways swipe for navigation in favour of a single-screen view with pop-up menus.

The dialler and calculator apps have seen a similar revamp. Cortana now shares the desktop app's look and feel as well, and there's set to be much broader text-to-speech support in Windows 10 for phones. These features are currently restricted to US residents, although those of you running this preview here in Australia can get them partially working for the time being at least by changing the language, region and speech settings to US English.

WHAT ISN'T WORKING YET, AND A "KEY" NEW FEATURE

Not everything promised in the launch announcement for Windows 10 for phones is working yet. One such example is the unified notifications system, dubbed Continuum, which will eventually tie your phones, tablets, laptops and desktops all together in one homogenous whole. When this is working, the idea is that you should be able to dismiss an alert on the desktop, and it should then disappear on your phone as well. And vice versa.

However, we did spot one small improvement that works very well indeed. The keyboard now sports a small blue dot nestling in the junction between the Z, X and comma keys.

This acts as a four-way virtual joystick: press and hold it in any direction for fine control of the cursor.

INITIAL VERDICT

It's clearly early days for Windows 10 for phones, and there's a long way to go for Microsoft's developers. There's plenty here that's incomplete, not yet working, or just plain buggy. None of what we've seen so far is likely to improve Microsoft's biggest problem, which is the lack of depth of apps that work across both phone and desktop in the Windows Store. We're also yet to see how Microsoft's universal apps strategy is going to pan out with third-party developers. However, there is encouraging evidence that Microsoft's developers have sat down and had a long, hard think about how to take Windows Phone forward in a constructive manner.

Jonathan Bray

COMPATIBLE PHONES

Nokia Lumia 630, 635, 636, 638, 730 and 830

Acer Veriton Z4810G

SOLID, IF UNREMARKABLE

This basic All In One would suit social use and casual gaming, as well as serving in a SOHO environment running Office, or, would pass with flying colours as the veritable 'kid's homework machine'. Its specifications are basic, with no frills internally, or in useability features. As such, for the price, it's an unremarkable but solid general purpose machine.

Many corners have been cut to keep the price down. There is no volume control button or dial at all for the built-in speakers (leaving you to use Windows software controls), and brightness adjustment is via a single button that resets everything to darkest when pushed, with multiple taps needed to level it up as you cycle through the options, and no OSD to let you know if you're a push away from resetting to darkest. There's just a single USB port on the side, the remaining five are tucked away at the bottom-rear inside a cavity that is impossible to see, and connections must be made by touch, or by laying the

machine on its face.

The i5 4570T CPU @ 2.9GHz (maximum Turbo frequency) is powerful enough for most tasks. It's paired with 4GB of RAM. The integrated Intel 4600HD graphics will suffice for the likes of World of Warcraft and older, less demanding titles.

The Western Digital 500GB hard drive is partitioned into two 219GB volumes, an empty 'Data' partition, and the OS 'Acer' partition, which is empty and is presumably intended for files that must be easily seen and accessed, such as the user's media.

The 23-inch touch screen is relatively dim, even at maximum brightness, but is perfectly functional in all but the brightest environments. Touch itself was a little laggy and screen detail a little coarse, but is perfectly fine for all but professional image work.

It all points towards a bare-minimum PC, meeting a similar user need. However, \$1499 is pushing it for this configuration, especially when Acer's older Aspire U5-620, another 23-inch touch AIO but with



twice the HDD capacity and 8GB of RAM, and an almost identical CPU can be had for under \$1300 at retail.

Ben Mansill

KEY SPECS

\$1599 (\$1499 for non-touch screen model)

www.acer.com.au

i5 4570T CPU @ 2.9GHz • 4GB RAM • Intel 4600HD graphics • 500GB HDD • 23-inch 1920x1080 touch screen • DVD Super Multi drive • includes keyboard and mouse

OVERALL



Gigabyte Brix s GB-BXi7H5500

PUNCHING WELL ABOVE ITS WEIGHT

This is the most powerful NUC that's been through the Labs, and its \$799 price reflects the components and features included in this little gem.

The included CPU is an i7 5500u (which is not upgradeable as it's soldered to the motherboard as part of the standard NUC design), with a base frequency of 2.4GHz and Turbo of 3GHz. As is the way with NUCs (all Gigabyte NUC's are branded

'Brix'), you will need to add a drive (2.5-inch SATA HDD or mSATA SSD), which will of course also need an OS, as well as RAM (SO-DIMM DDR3L).

Considering that the current cost of a 4GB DDR3L SODIMM is around \$50 (PC Case Gear, Kingston KVR16LS11/8), or \$99 for 8GB, and a 1TB 2.5-inch HDD can be had for less than \$100 (Hitachi HG ST Travelstar), then you have yourself a serious powerhouse for under a grand in the palm of your hand. Another couple of hundred dollars for a basic 24-inch monitor, plus an OS, which could be a free one like Ubuntu, and you have a PC that seriously outclasses many off the shelf systems, like the Acer on this page, for fewer dollars.

How you use a Brix (or NUC) is open. It can be a desktop replacement (and the VESA mounts let you attach this to the rear of a monitor to keep things very tidy), or forgo a monitor and connect this to your TV as a gaming or media PC. The Brix s has an 802.11ac Wi-Fi module as well as Bluetooth, further expanding its potential.

Small form factor PCs like this are on



the rise, and are no longer a curio in the PC form-factor world.

The Brix s is a sharp looking unit with good connectivity and is priced to compete with big box systems.

Ben Mansill

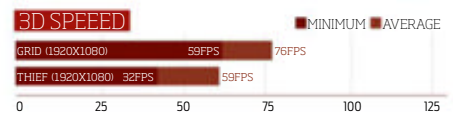
KEY SPECS

\$799 • www.gigabyte.com.au

i7 5500u CPU @ 2.4GHz • 4 x USB 3.0 • HDMI • Mini DisplayPort • LAN • VESA bracket included

OVERALL





Gigabyte P37X

HUGELY EXPENSIVE, YET HUGELY POWERFUL

Gigabyte has been on a bit of a roll when it comes to laptops of late. Its spin-off corporation, Aorus, has been releasing crackers for the last year, while Gigabyte's in-house models aren't anything to sniffle at either. Now along comes the P37X, the world's lightest 17.3 inch laptop to feature Nvidia's blazing new GTX 980M. As one of the most expensive gaming laptops around, the P37X has a lot to prove, so let's see if it's got the goods to back up the price tag.

The P37X is simultaneously massive yet tiny. In terms of the length and width, it's a whopper thanks to the large 17.3 inch display, yet it measures a tiny 22.5mm deep. Most gaming laptops with a screen of this size tip the scales well in excess of three or four kilograms, but Gigabyte has trimmed the fat to lower the weight to just 2.7kg (add another hundred grams if you included the optical drive). This makes it surprisingly portable for such a behemoth, proving that road warriors needn't totally compromise mobility for performance.

Built from a mixture of aluminium and plastic, the P37X foregoes the bold

colours and flashy backlight of other gaming notebooks, instead adopting a very utilitarian, black businesslike exterior. Despite the screen's large dimensions, it sticks with the good old 1920 x 1080 HD resolution, yet the image quality hasn't suffered. Pixel structure is impossible to notice, and the anti-glare finish makes it easy to see in bright environs.

The large chiclet keyboard is easy to use, as is the responsive touchpad. There's even room for six macro keys down the left hand side of the laptop, it's that spacious. It all feels nice and solid in spite of the very thin base, suggesting it's got a stronger internal chassis than most laptops.

Thanks to the large dimensions, owners will be spoilt for choice when it comes to I/O ports. Four USB ports are included, two each of the 3.0 and 2.0 varieties, while HDMI, mini DisplayPort and D-sub provides several video output options. Gigabit Ethernet is a given, as is the headphone/SPDIF out. Finally there's the ubiquitous SD card reader. 802.11b/g/n/ac and Bluetooth 4.0 provide wireless connectivity.

Delving under the hood reveals a machine stacked to the brim with high-powered components. At its heart is

Intel's speedy i7-4720HQ quad-cored HyperThreaded processor, which peaks under load at 3.6GHz. 16GB of DDR3 memory is also included, and it's of the speedier 1866MHz variety. The storage subsystem hasn't been neglected either, with twin 128GB SSDs providing the primary partition, while two 5,400RPM drives are hooked up in RAID0 mode to deliver 2TB of speedy long term storage.

But it's the GTX 980M that gives this machine its true gaming credentials. Rather than put it through our usual laptop benchmarks, we gave this laptop a true gaming torture test, running the same tests that we use for desktop graphics cards. Grid Autosport was run at 1920 x 1080, 4XMSAA and Ultra detail, and the P37X blitzed the test with a minimum framerate of 59, while the average was 76. Even the demanding Thief benchmark ran beautifully at high detail, HD resolution, with a minimum framerate of 32 and average of 59. Battery life was surprisingly good for such a bruiser, clocking in at 2 hours and 57 minutes.

There is a price to pay for this performance, in the form of relatively high fan noise. There's also the fact that it costs just over three grand. Still, if you're looking for a true gaming laptop and don't mind paying for it, the P37X is a potent performer.

Bennett Ring

KEY SPECS

\$3099 · www.gigabyte.com.au
17 inch screen · GTX 980M 8GB · i7-4720HQ (2.6GHz base, 3.6GHz Turbo) · 8GB x 2 DDR3L (1866MHz) · 128GB x 2 SSD + 2TB 5400rpm HDD

OVERALL



Lenovo ThinkPad Helix

GREAT TABLET, HORRIBLE BASE

Lenovo's ThinkPad range has been hugely successful in the business world, thanks to their combination of reliability, performance and corporate-focused features. The Helix aims to deliver these three attributes in the format of a 2in1 convertible tablet. There's no denying that it packs some serious hardware for such a slim machine, but the entire package has one massive Achilles Heel – one of the worst stands we've seen on a convertible.

Before we explain why we're not fans of this, let's take a look at the tablet portion of the package. The 11.6 inch screen packs a full HD resolution of 1920 x 1080, and it's a very respectable performer with decent viewing angles and excellent image quality. Being a Windows 8.1 tablet it's also a touch-screen, and accuracy with the included Wacom stylus is excellent. It doesn't seem to have the same pressure-sensing of Microsoft's Surface though, and there's absolutely no mention of this feature in the specs. The stylus slides away inside the base when not in use, making it easy to keep track of.

The tablet itself is tiny, measuring just 301mm by 192mm by 10mm, and weighing in at just 795 grams. It doesn't get much more portable than this, yet Lenovo has managed to squeeze some impressive hardware within the razor-thin shell. Our sample came with Intel's power-sipping M-5Y70 CPU, which ramps up to 2.6GHz when the going gets tough. This includes the Intel HD Graphics 5300 solution, which is fine for playing of HD videos but

will struggle with any dedicated 3D work. It's paired with 8GB of memory, more than enough for the usual office activities that this tablet will undertake. A 256GB M.2 SSD provides all of the storage, so cloud backup or an external drive will likely become necessary after a few month's use, as there's no option to increase the internal storage. A two megapixel 1080p camera graces the front of the tablet, while a five megapixel 1080p camera adorns the rear. The image quality for both is excellent, with the front fine for video conferencing while the rear is adept at capturing images and video.

Thanks to the decent hardware within, performance was snappy and responsive even with multiple applications open at once. Obviously it's not going to compete with dedicated laptop CPUs, so the ho-hum PCMark 8 Home Accelerated score of 2176 isn't too shabby at all. Battery performance was solid, coming in at four hours and one minute in the PCMark 8 Home Battery Test.

If there's one price to pay for the tablet being so thin, it's a lack of I/O options. A single USB 3.0 port sits next to the MicroSD reader. An optional 3G/4G port can house the necessary SIM card for built-in wireless broadband access, while a Micro HDMI output rounds out the range of ports. There's no Ethernet adaptor built-in; instead Lenovo packs in a USB to Ethernet adaptor. Thankfully the Intel dual

band adaptor supports the fastest Wi-Fi speed of 802.11ac, as well as older legacy connections.

While the tablet itself is very competent, things fall apart when the base is included in the equation. It's a very simple keyboard base, and its main flaw is the lack of hinge for changing the angle of the screen. The tablet can be mounted in one of two ways – either in an upright, laptop position, or closed and unusable. There's no way to fold the screen backwards and stand the unit in tent mode, which most other tablets can do. If you don't like the default angle of the screen in laptop mode, too bad, as there's no way to adjust it at all. The benefit of this lack of adjustment is that the screen is held rigidly in place, so won't bounce when touched, but a lot of versatility has been sacrificed as a result. In fact, this is the only 2in1 Convertible that we can think of that doesn't have a 180 degree hinge. There's also another problem – in laptop mode the screen simply rests in place, and isn't locked in. Try using it on your lap and there's a good chance the tablet will fall out.

There's also the price – at over two grand this is one of the most expensive convertibles on the market. When stood next to something like the Surface Pro 3, the lack of versatility and questionable base make this a hard purchase to justify.

Bennett Ring



KEY SPECS

\$2099 • www.lenovo.com.au
11.6 inch display • Intel M-5Y70 CPU (1.1GHz base, 2.6GHz Turbo) • 8GB memory • 256GB SSD

OVERALL





Philips BDM3470 Ultra Wide Display

WIDESCREEN THAT FINALLY WORKS

The fad of Ultra Wide, or 21:9, displays isn't a new one – we first checked out this format of display over a year ago. Logically this aspect ratio makes sense, delivering a multi-monitor experience without nasty bezels splitting up the display. Perfect for displaying several active windows at once, they also make sense for gamers, where the ultra-wide format fills more of the gamer's field of view.

Unfortunately early 21:9 displays all had one major issue in common that prevented them from being must-have devices – poor image quality. The primary problem was related to LCD's issues with viewing angles, where the colour of the display changes depending on the angle it's viewed at.

With PC users sitting relatively close to these displays, the low viewing angle made colours towards the edge of the screen start to change, making it hard to make out information at the extremes of the screen. High response times also led to plenty of motion blur, a serious no-no for gaming.

The good news is the BDM3470 has basically solved both of these concerns.

Thanks to an extremely wide viewing angle of 178 degrees, the old issue of the colour changing towards the edge of the screen is no more. This is thanks to the AH-IPS LED screen technology employed here, which is also responsible for the low 5ms grey to grey response time. However, this response time is only found when

the display's SmartResponse feature is enabled; turning it off increases the response time to 14ms, causing motion blur to rear its ugly head. Thankfully SmartResponse doesn't seem to compromise image quality much, if at all – we did our image tests with this enabled.

Before we dig into these tests, let's look at the physical exterior of the display. The SmartErgoBase stand is basically perfect, allowing for a high-range of movement

across height, swivel, tilt and rotation axis. Yet it's also quite the looker, reinforcing the sexy lines of the display itself. The BDM3470 uses a bezel-free design, with the screen stretching all the way to the edge of the chassis. However, there is a small black border of around 7mm around the image, but it's not very noticeable. The onscreen display is manipulated using physical buttons – we'd have loved to see slicker touch controls on a panel of this price. The OSD is easy to navigate, and unlocks some fairly deep colour calibration options. It's not quite configurable enough for image professionals, but the rest of us should be able to extract an excellent image out of this panel with just a few minutes of tweaking.

Input options are numerous, with VGA, DVI-Dual Link, DisplayPort and HDMI all supported. The HDMI input is also compatible with the relatively new MHL standard, which allows smartphones and tablets to output to the display. As with other DisplayPort monitors we've tested, the unit ships in 1.1 mode, limiting it to just 30Hz. Changing it to DP 1.2 mode via the OSD unlocks the full 60Hz refresh rate. Philips' MultiView is the name given to its screen splitting option, allowing two devices to be displayed on the screen simultaneously. In this instance, the image is split down the middle. Four USB ports are offered, with two of the 3.0 variety and the remainder of the slower 2.0 flavour.

The screen packs a whopping 3440 x 1440 pixels, and the pixel structure is basically invisible even at very close ranges. Switching on the display reveals a very bright backlight that is also extremely uniform, surprising given the large size of the panel. We used the online image quality tests at lagom.nl to put the screen through its paces, and it passed with flying colours (pardon the pun). Whether it was the black level, white saturation, gamma calibration or gradient tests, the BDM3470 breezed through all of the tests effortlessly.

Obviously a panel of this quality and size isn't going to be cheap, but you're getting a whole lot of pixels for a grand. Whether you choose to employ them for work related duties or widescreen gaming, the BDM3470 is up to the task. Just remember that running games at this resolution will require more than the usual amount of horsepower.

Bennett Ring

KEY SPECS

\$999 • www.philips.com.au
3440 x 1440 @ 60Hz • 34" diagonal • AH-IPS LCD • 5ms gtg response

OVERALL





MSI GE Apache Series – GE62 and GE72

POWERED BY NVIDIA'S NEW GTX 960M

Coinciding with the release of Nvidia's latest laptop GPU, the GTX 960M, MSI has updated its Apache series to incorporate this new mainstream mobile chipset. The release of the GTX 960M has been timed shortly after the release of the respectable – if a little underwhelming – GTX 960 desktop GPU, making this is our first chance to see what Nvidia's new mainstream mobile solution can do. While the price is obviously nice, can the GE62 and GE72 deliver the “desktop-class performance on a notebook” that MSI promises?

SAME, SAME, BUT DIFFERENT

Given the close proximity in pricing, it's no surprise to see that these two laptops have extremely similar specs. The biggest difference is the overall size of each, dictated by their displays. The smaller GE62 packs a 1920 x 1080 punch in the form of a 15.6" display, while the larger

GE72 spreads the same resolution over a larger 17.3" screen. This has led the larger of the two to weigh in 2.7kg, compared to 2.4kg for its smaller sibling. Neither is especially slim nor light, making them unsuitable for road warriors who care for a spot of Call of Duty between meetings.

Each display uses backlit LED technology, topped off with an anti-glare screen. Viewing angles were acceptable, though they're not the kind of display that will work well with four or five people huddled around the screen. Both laptops sport a chassis built from both plastic and brushed aluminium, with the outside of the display and keyboard built from the latter. Overall the units feel reassuringly sturdy, with very little display or keyboard flex. MSI has been using SteelSeries keyboards in its laptops for quite some time now, and once again we see this quality component put to work in the Apache series. Despite the larger



size of the GE72, the keyboards on both laptops are identical, and both employ RGB backlighting that can be configured to shine in any colour imaginable. As with the keyboard, the touchpad on both is identical, and we appreciated its accurate, reliable tracking.

DOLBY SURROUND SURROGATE

New to the Apache series is the inclusion of Nahimic Sound Technology. Based on information on the official Nahimic website, this appears to be a similar technology to Dolby Surround and DTS Headphone, delivering virtual surround audio over stereo headphones. It also promises to deliver cleaner voice, as well as offering a bass boost. Unfortunately neither review unit had the Nahimic control software installed, so we had to jump through a few driver and software installation hoops to get it working. Sound quality over the built-in speakers was pretty dismal, as expected, but improved markedly when using a set of quality headphones. Enabling the Nahimic software improved things even more, though the virtual surround wasn't quite as impressive as Dolby Headphone.

A healthy range of I/O ports adorn the exterior of both laptops. Two extra monitors can be connected via the Mini DisplayPort and HDMI 1.4 outputs, while three USB 3.0 and one USB 2.0 ports

"It's obvious that Nvidia has taken an axe to the chip, severely slashing performance"

deliver plenty of options for external peripherals. The usual SD card reader is also in place, along with 802.11 b/g/n/ac Wi-Fi. Rounding out the connections is the Killer LAN Ethernet port, which prioritises game traffic over more mundane data duties.

KEY SPECS

Delving under the keyboard reveals the same Intel CPU powering both machines, in the form of the i7 4720HQ processor. We've seen this used on many gaming laptops, as its HyperThreaded quad-cores running at 3.6GHz under load are plenty powerful enough for any of today's games. This is matched up with 8GB of DDR3 1600MHz memory. Where the two machines differ is the inclusion of an SSD; on the cheaper GE62 this is an optional extra, while the GE72 comes with a small 128GB SSD. The impact this has on desktop performance can't be understated – trying to multitask on the GE62 as it installed Steam backups was slow, reminding us what computing used to be like in the pre-SSD days. As such, we'd highly recommend installing the optional SSD in the GE62. The Optical drive in place is an entry level DVD burner, which seems a little cheap given just how affordable Blu-ray drives are these days.

These specs are all par for the course; where things get interesting is the new GTX 960M GPU. On both systems this has its own dedicated 2GB GDDR5 memory. As expected, the GTX 960M is a mere shadow of the GTX 960 desktop component, despite the incredibly similar naming, and it's a marketing ploy

▼ The biggest sinner is Nvidia, and its mobile GPU naming convention



▲ As usual, gaming laptops have somewhat divisive styling

that still bugs the hell out of us. Those expecting similar performance to the GTX 960 desktop GPU will be in for a rude surprise, despite both being based on the same Maxwell architecture. Built on an identical 28nm process, the GTX 960M only has 640 CUDA cores, compared to the GTX 960's total of 1024. Total memory bandwidth has also dropped, down from 112GB/sec in the desktop part to 80GB/sec in the mobile variant, yet both are running over a 128-bit memory bus. Neither Nvidia or MSI advertises the Boost Clock frequency of the GTX 960M, though the Base Clock speed is close to the desktop part, at 1096MHz vs the desktop's 1127MHz. We're guessing this is variable, depending on the thermal condition inside each laptop that the GTX 960M is employed in. Unfortunately details on the rest of the GTX 960M are thin on the ground, with no mention of the total ROPs or Texture Units. If they're not advertising these specs, it's safe to assume that they've been rather dramatically trimmed in the transition to mobile.

Given the fact that the GTX 960M is based on the Maxwell architecture, it's no surprise to see that it supports the myriad of proprietary Nvidia features. PhysX support is a little ambitious for such a lowly GPU, but the inclusion of the MFAA anti-aliasing will come in handy for those who want to kill jaggies without sacrificing performance. Nvidia's Battery Boost technology is also included, allowing gamers to cap frame rates to extend battery life; we left this feature disabled for our game and battery tests.

Rather than just run our standard 3DMark graphics test, we wanted put the GTX 960M through its paces over a variety of game tests, so also tested with our GPU benchmarks, in the form of Thief and Grid Autosport. However, rather than run these tests at their maximum graphics

detail, we settled on medium settings to give the GTX 960M a fighting chance. After all, it's a mainstream GPU, not an enthusiast component. Grid Autosport was first off the racks, running at 1920 x 1080, with 4XMSAA and medium detail. The average framerate clocked in at 52, but it dipped regularly, with a lowest framerate of just 37. Thief fared even worse. While running at 1920 x 1080 with the normal detail preset, it reached an average framerate of just 38, with a low of 4. This is borderline playable, putting paid to the claim that the GTX 960M can deliver true desktop gaming performance. When compared to the desktop GTX 960.

Just to be thorough we also ran the 3DMark Sky Diver test, which is aimed at performance laptops. The overall score of 12554 puts it well behind machines powered by the GTX 970M. If there is one silver lining in this performance cloud, it's the overall PCMark 8 results, which test the laptops for basic desktop duties. The SSD-equipped GE72 performed best, with an overall score of 3409, with the GE62 nipping at its heels with a score of 3171. Unfortunately the PCMark 8 battery performance test rounded out the disappointing results, with the GE72 lasting for just 75 minutes, while the GE62 lasted a little longer at 92 minutes.

Given MSI's solid reputation for delivering gaming laptops that can actually play games, we thought we'd seen the last of gaming laptops that barely have enough grunt to play World of Warcraft, let alone modern titles like Evolve or Battlefield Hardline. Yet the updated Apache series is just that; while the marketing material makes bold claims about smooth performance at high detail, the reality is far from so. It's no wonder they're both relatively cheap machines, but is it really worth saving a few hundred dollars when gaming performance is so compromised? We think not.

Bennett Ring

KEY SPECS

GE62 - \$1799, GE72 - \$1999 • www.msi.com

GE62 - 15.6 inch display • GTX 960M • i7 4720HQ (2.6GHz base, 3.6GHz Turbo) • 8GB DDR3 1600 • 1TB 7200rpm HDD

GE72 - 17.3 inch display • GTX 960M • i7 4720HQ (2.6GHz base, 3.6GHz Turbo) • 8GB DDR3 1600 • 128GB SSD • 1TB 7200RPM HDD

PCMARK 8

Home Overall Score (GE62): 3171

Home Overall Score (GE72): 3409

OVERALL





D-Link AC 3200 DIR-890L

EYE-CATCHING DESIGN WITH A PRICE TO MATCH

Why is it that the more expensive a router is, the more outlandish its outer shell design must be? Just take a look at this premium product from D-Link, which outdoes Netgear's bat-modem to take the cake as one of the oddest looking routers available. So it costs a pretty penny and looks like something stolen from the Museum of Contemporary Art, but does it deliver the high-speed Wi-Fi network promised?

This is a true tri-band router, making it more suited for environments that have multiple devices all running simultaneously. The first band delivers 600Mbps on the 2.4GHz channel (802.11n/g/b), while twin 1300Mbps channels are offered at 5GHz (802.11ac/n/a). So while D-Link advertises this as a 3200Mbps router, like most it only offers a maximum of 1300Mbps to an individual device, as the device can only connect to one of the channels at a time. The internals of the unit are powered by a Broadcom dual-core 1GHz processor, which can also be found in other high-end routers. A whopping six different antennas are permanently affixed to the base; while

this is a high number for a router, they're not detachable. As those in challenging Wi-Fi environments can attest, installing a high-quality antenna to a router is a great way of boosting performance, but because the six here are firmly fixed to the base, it's not an option.

Before we delve into the interface, let's check out the range of external ports available. Four Gigabit Ethernet ports are included, along with just two USB ports. One is of the higher 3.0 standard, the other plain Jane 2.0. A reset and WPS button round out the buttons on the rear.

Diving into the interface is as easy as typing the router's default IP of 192.168.0.1 into your web browser. Is it just us, or do most network devices default to the 192.168.1.X range instead – if that's the case with your existing network, it's probably easier to change the default IP of the router, than go through and change all the IPs of your devices (obviously this is only an issue if you use static IPs for your devices, as we do). Once we were in the interface we were pleasantly surprised by D-Link's revamped menu design, which only exposes enough information for

network newcomers to do the basics, with more advanced features hidden away so as not to confuse. The Quality of Service screen is almost too easy; simply drag each device into a priority of Medium, High or Highest. Unfortunately it means only one device can get top priority. Port forwarding is also easy, but it seems that only 15 ports can be forwarded, which could be a major issue for gamers – we've had up to 40 or 50 rules setup on competing Billion routers, to accommodate the vagaries of online gaming. Ditto with the banned websites page, which again only supports up to 15 entries. Despite these

limitations, we truly do appreciate the ease of setup of this device, and the snappy response of the menus when changing options. Serious network boffins will probably scoff at the lack of options though – it's obvious this thing is designed for relatively simple home networks.

Plugging an external USB drive into the router allowed us to share all of its contents with connected devices, and the router also operates as a DLNA server. Remote VPN access is supported, but Apple users will rue the lack of Time Machine backups.

When it came time to test the device, we ran four different tests. The first was on the 5GHz band at a range of five metres, and we recorded a throughput of 589Mbps, which is exceptionally fast. However, testing the same band at 15 metres and through two drywalls, it dropped to 145Mbps, one of the slowest results encountered on a high end router. The next test saw the 2.4GHz band tested at the same ranges, and it posted a throughput of 125Mbps at close range, dropping to 30Mbps at longer range.

For the price, these results simply aren't fast enough, with more affordable routers delivering better throughput at longer ranges. The lack of configuration options will also make this router unsuitable for experienced networkers. There's no denying that it's a good-looking and easy to configure router, but we expected more from one of the most expensive routers on the market.

Bennett Ring

KEY SPECS

\$329 • www.dlink.com.au

Tri-band (1 x 2.4GHz; 2 x 5GHz) • 1GHz dual core processor • six fixed antennae • 802.11n/g/b/a/ac

OVERALL



Gigabyte X99-SOC Champion

NOT FOR THE AVERAGE PC

Intel's Haswell-E CPU is pure overkill for the vast majority of PC users, with its eight cores mostly sitting idle unless heavy video editing or data processing duties are applied. One group loves it though – extreme overclockers. What could be more impressive than taking the most expensive chip in Intel's consumer range and pushing it to the absolute limit, and it's a tricky beast to tame thanks to the sheer size and complexity. Gigabyte's X99-SOC Champion is a large E-ATX motherboard aimed squarely at this group, with a raft of features that only become useful when liquid nitrogen is applied.

First and foremost is the inclusion of an overclocking socket, which is similar to the OC socket employed by Asus. A standard X99 motherboard socket has 2011 pins, but the overclocking socket used here bumps this up to 2083. This allows overclockers to bypass Intel's troublesome FIVR voltage system, and adjust new voltage settings in the BIOS (thankfully the FIVR subsystem appears to be going the way of the dodo in Intel's next range of CPUs). Due to the high likelihood of this board being used with liquid nitrogen, Gigabyte has provided plenty of space around the CPU socket for tweakers to install extra insulation.

Several overclocking switches and buttons can be found on the top right of the board, and these handle the CPU mode (normal or OC), a DualBIOS switch in case one BIOS is corrupted, the OC trigger switch, and voltage measurement points. As expected for an overclocking board, buttons for reset, power and



clear CMOS are also included. A total of five fan headers provide plenty of juice for water coolers and fans, while the PCIe express lanes are supplied with additional electricity via a SATA power connector, helping to stabilise the power supply when multiple graphics cards are installed. Speaking of which, this board supports up to four graphics cards at a time, and Gigabyte supplies three different graphics card bridges to accommodate any combination.

Gigabyte rates the four DDR4 memory slots as capable of speeds up to 3400MHz without any issues, though overclockers should be able to push past

this. Given the huge importance of a clean power supply to extreme overclocking, the X99-SOC comes with a raft of features designed to deliver just that. Gigabyte is still the only company we know of that uses Single Package MOSFETs in the form of the PowIRstage chips used here, which operate at lower operating temps compared to traditional multi-chip solutions. Server-grade chokes are also present, along with Black solid caps, which are designed to be ultra-durable compared to standard capacitors. All of the major components on the board are cooled via a heatpipe/radiator combination; surprisingly water cooling is absent.

Looking at the non-overclocking features of this board, the X99 backbone delivers in spades. Two PCIe x16 lanes sit alongside another two PCIe x8 lanes, while three smaller PCIe x1 lanes reside between the full length slots. A single M.2 PCIe x4 connector is included, along with a single SATAe connector. A total of ten, yes, ten, SATA 6Gb/s connections are ready for your high speed drives, while six USB 3.0 and eight USB 2.0 ports provide plenty of external connections. If there's one area that's lacking, it's the Realtek ALC1150 audio codec; we're guessing the intended audience of this board will disable it anyway. A small OC Panel connector is included, allowing buyers to shell out for this add-on if they feel it's worthwhile.

Heading into the BIOS reveals a plethora of options that will humble even the most experienced tweaker. They must work, as this board has set more overclocking world records than any previous Gigabyte product, with dozens of wins under its belt.

Make no mistakes about it – this is a board aimed at extreme overclockers. If you're a hardcore gamer who wants an X99 board for quad-GPUs, there are better, gamer-oriented solutions out there. But with this product demolishing the competition, Gigabyte has delivered a board that is truly deserving of the name Champion.

Bennett Ring

KEY SPECS

\$529 • www.gigabyte.com.au

Intel X99 Express Chipset • Socket LGA2011-3 • E-ATX • 2 x PCIe x16 • 2 x PCIe x8, 3 x PCIe x1

OVERALL





Creative X7

UNDERNEATH THE AUDIO PROCESSING GUBBINS LIES A HEART OF SONIC GOLD

The Creative X7's gaming origins are clear from its styling, its extensive sound tweakery and inclusion of gaming modes, but in hi-fi terms it is a digital amplifier, combining DAC, headphone amplifier, and internal amplification to drive a pair of speakers.

Its connections are versatile though somewhat confusing. On the input side, easy enough - there are four: one analogue input, one optical digital input, one USB slot (for playing from and charging smart devices, but not for sticks or drives of content), one USB input to run from a computer. This last uses a microUSB slot on the X7, with a cable provided with a full-size USB plug on the other end.

What you do with its outputs will depend on your system. You can have it output through standard RCA phono plugs in analogue stereo into your hi-fi system. But the X7 can also decode 5.1-channel surround, so there are two minijack stereo sockets, one providing stereo rear signals and the other centre and subwoofer signals, should you wish to add amps and speakers for those.

You can take an optical digital output and run that into a better DAC or digital amplifier (though in this configuration it might seem rather a redundant device). Or you can drive a pair of speakers with it directly - it has proper binding posts and claims an internal power of, well, the headline on the X7's website is "Kickass 100W amplifier", but this is 2 x 50W into four ohms, measured at 1kHz and with a

whopping 10% THD. Given it's unlikely that speakers being used with this will have nominal four ohms impedance, and that hi-fi fans might prefer something three orders of magnitude smaller on the THD front, we would point you to the more realistic claim in the specifications of 2 x 20W with eight-ohm speakers at 1kHz with 1% THD.

Extending measurement across the full audio bandwidth might knock another 10-20% off that power rating, and that's still with 10 to 100 times the distortion of a good hi-fi amp. Still, we don't tend to get bogged down in power claims, which are an unreliable source of comparison at the best of times; let's judge what it can do, starting with having the Creative X7 doing just what the Soundblaster team should know how to do - get computer audio out of the USB socket and into the real world. For this Creative offers driver software for both PC and Mac - this is usual procedure when using DACs with a PC in order to get into higher-res audio territory. But it's less common for Macs, so we tried first just using our normal Amarra/iTunes software combination and selecting the Creative as our audio device in System Preferences. It was listed there three times - first as an input device, secondly as just 'Sound Blaster X7', and again as 'Sound Blaster X7 Digital Out'. The second of these allowed output frequencies up to 24-bit/192kHz (up to six-channel), the latter only up to 96kHz, the limit imposed by the unit's optical digital output.

So you need to select the relevant 'device' depending how you're intending to connect up to X7 - when we chose the straight 'Sound Blaster X7' option, the X7 was fine outputting from both analogue and optical outputs simultaneously, but we realised that the optical digital output was delivering at 48kHz regardless of sample rate (even 44.1kHz files). This could only be changed by using that 'Digital Output' option in System Preferences.

To compare sound quality we ran the optical output into a Musical Fidelity M1SDAC (an ampliDAC with an RRP of \$1299, so were able to do quick A-B-C switching between the X7's analogue output, its digital output run through the Musical Fidelity, and the Musical Fidelity itself playing from the same computer.

The results were, predictably, good, better and best. The Creative X7 delivered a slightly less smooth but still impressively resolved and musical performance from our test tunes. On kd lang's tricky complex version of 'The Air That I Breathe', it kept the different elements separate and clear, just slightly dimming the subtle right-channel snare, slightly sharpening the layered vocals on the chorus, but not flattening everything out as do many DACs even at this price. Last year's remaster of Tears For Fears' 'Broken' showed a little lightness in the upper bass which could slightly thin out older recordings that are already light on the low stuff.

To achieve this clarity, we should note, we defeated the illuminated 'SBX' button on the right of the main unit, which was pushing a wedge of bloated and horrible bass into the equation. Creative has long had a fetish for messing with audio, and once we loaded that Mac driver software for the X7 it turned out to offer a myriad ways to bugger up the sound. Under its 'default' it will add 30% bass, 12% pseudo-surround, and a whole 50% of "crystallizer" (which sounds like a lows-plus-highs boost as used in many "MP3 enhancer" circuits). The bass control also has a "crossover frequency" slider, which audibly removes bass... hopefully adding it to the 'sub' minijack output (we didn't wire this unit up for surround). Then there's Smart Volume to compress dynamics, and 'Dialog Plus' to pinch up the mids. On top of this is a 10-band EQ section, which defaulted flat but adds an apparently random upper bass dip and low/high lift if you are foolish enough to select the 'Music' profile. A 'Cinematic' section further compresses dynamics (admittedly sometimes useful with movies, especially when night viewing).

We suggest setting this crazy box of tricks to have everything off, everything flat, nothing added thank you, no, no, NO - and you'll be a lot closer to getting hi-fi performance.



To hear how the internal amps performed we plugged the Creative's speaker sockets into three different sets of speakers - a comparably priced pair of bookshelf Quad 9L2s with a friendly 6-ohm impedance (though not so friendly for the X7's back panel switch which offers a choice of 4 or 8 ohms), a pair of highly revealing German T+A standmounters, and finally our beloved great JBL 4429 Studio Monitors. For sit-back listening, you're missing any remote volume control, but you can download an app for iOS or Android, which offers volume control as well as all those sound-buggering options.

At moderate levels the Creative's amplification drove the standmounters well, but getting even slightly loud and with complex music, the power limitations

were audible. We were enjoying at quite a push the beautiful 2000 recording of 'Both Sides Now' by Joni Mitchell, the little Quads showing their quality with a rich deep portrayal of the strings while Joni's vocal was solid and just a little overplummy in the centre. But as they song grew and the surge of complexity arrived at the chorus, the layers broke down, and we had to back the volume down.

We enjoyed Creative's DAC conversion, which sounds well up with its price. It is highly versatile in its socketry, perhaps a little too much so if investment here took funds away from the amplification, which is clear and high quality within its limits but which begins to show those high THD levels when taken to high playback levels and with music requiring power to separate its complexity. We liked its headphone output, which had fewer power limitations - it drove both portable and home-impedance headphones as well as you could hope for at this price, its sound smooth and strong right up to the volume's end stop (again, with everything switched to flat). For 600-ohm headphones there's a special high-output mode selectable in the app or software.

We very much dislike its control software, which makes every effort to change the sound away from purity,

despite Creative prominently describing the X7 as "audiophile". Audiophiles don't use EQ! (Though they might well like the ability to swap op-amp chips around in the X7's audio circuits, which Creative encourages you to try).

Only belatedly did we discover in the iPhone app (under 'Speakers/Headphones') a 'Direct mode' slider which "gives you audio in its purest form, directly from the source". Why on earth would you NOT want that? Use this slider! Even though we thought we had everything switched flat, 'Direct mode' significantly improved the sound further. The X7 is far better without all the sound-tweaking gubbins, and once stripped down, bare and pure, a pleasingly musical heart can be properly revealed.

Jez Ford

KEY SPECS

\$549 • www.creative.com.au

5.1 channel output • 127dB SNR • microUSB • Built-in Stereo Mic • microUSB • Built-in stereo mic • 1 x 1/8" (3.5mm) mic in • 1 x RCA aux/line in • 1 x TOSLINK Optical In • 1 x TOSLINK Optical Out • 2 x Binding Post Passive Speaker Out (L/R) • 1 x RCA Aux/Line In

OVERALL



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Labs Briefs

Sapphire Vapor-X R9 290X

\$569 • www.sapphiretech.com

AMD's R9 290X has been around long enough to see some quality cooling systems and bespoke designs tame the heat and noise of the early reference design. With 290X cards now around \$200 cheaper than Nvidia's GTX 980 cards, and offering almost identical performance (slightly better in some games, slightly worse in others), it's a very good choice for gamers.

Sapphire has always impressed us with its Vapor-X cooling, and the company has been an AMD-only maker for many years, and the expertise shows. It's very quiet and very effective. The 4GB version (the company also offers an 8GB model) runs AMD default speeds (1030MHz core, 5300MHz memory), but you can realistically expect 10-20% overclocking headroom should you want to push for it, or, Sapphire also have a factory OC version (1080MHz, 5640MHz).

Sapphire also hold their value better than many other brands on the second hand market, a plus when it's time to pass it on and upgrade again.

Ben Mansill

OVERALL



Steel Series Siberia Raw Prism

\$65 • www.steelseries.com

To buy a set of gaming cans at the \$60-80 price range usually means compromise.

With the Siberia Raw Prism Steel Series has managed to defeat the big trade-offs. They're comfortable, and this is something you just never see at this price. Large earcups enclose even large ears without overlap, and the material is a soft mesh with soft foam underneath. Typically they'd be too small, with hard foam and sweat-inducing shiny plastic covers for this sort of money.

Sound quality is acceptable. The sonic landscape is wide enough to make these good for gaming and music. There is some slight background hiss, but once the game or music starts it's smothered anyway.

There's no boom for the mic, which is embedded into left cup, but in testing voice was clear enough for game chatting. And there's bling. The sides glow in 16.8 million disco colours. All up a great choice for a nice price.

Ben Mansill

OVERALL



Antec P380

\$300 • www.antec.com

Antec's always delivered remarkably good solutions for PC enthusiasts looking for quiet solutions to high-powered computing, and the new P380 is the latest in one of Antec's flagship case families. While it is a classic of the P-series, it also takes a few interesting steps forward, however.

The all-black interior is well finished and provides lots of room, especially alongside the versatile HDD caddies – there are eight of these tool-less, slide-in models, spread over three drive cages, which must be removed to make room for long video cards and powerful SLI setups. There are dust-filters, spacious room for cable-management, extra-cooling, and water-cooling, all in a solid, well-built chassis that just exudes class and comfort for future upgrades.

Interestingly, it seems Antec has joined the no-optical-drive movement, and have removed 5.25in bays completely. This makes for a smooth front panel, but if you're still using a lot of DVDs for system back-ups or software installation, it may mean this is not the case for you. Otherwise, this is an excellent addition to a well-regarded series, albeit a touch on the expensive side.

David Hollingworth

OVERALL



Fractal Design Define R5

\$159 • www.fractal-design.com

Another company known for impressive silent computing solutions is Fractal Design, whose bitumen-based audio-damping material may add weight to its cases, but boy does it work. The R5 is the latest in this popular series.

Side by side with the P380, the cases are very similar. Both boast modular drive cages to make the most of space for either gamers, or those who really like a LOT of drives. There's room for any combination of air and water-cooling you might wish for, all built into a sturdy body.

What sets it apart, though, is what counts. It uses metal caddies for its drive bays, in a contrasting white that matches the included fans and expansion brackets, and it's a bit shorter in height, though squatter by comparison, too. Overall, while the Define R5 isn't as roomy as its competitor, it is a lot cheaper, and for some, more versatile. At nearly half the price, with sound-dampening that is at least the equal of the Antec, it's a hard case to ignore.

David Hollingworth

OVERALL



OCZ ARC 100 SSD 240GB

\$130 • www.ocz.com

The OCZ ARC 100 is one of the cheapest SSDs you can buy, generally matching Crucial's MX100 for cost by capacity. It sports quality hardware, running parent company Toshiba's A19nm MLC flash (also utilised by the premium Corsair opposite). The Barefoot 3 M10 controller isn't the fastest or the newest, but is certainly good enough to deliver a claimed 480MB/s write and 430MB/s read.

Your results will vary, as SSD performance is very much affected by the SATA controller on your motherboard. We tested this drive on an AMD system with the newer A75 chipset and recorded 420MB/s write and 386MB/s read. Those are certainly respectable numbers and at the cheap end of town for SSDs it all represents a good value drive.

The SSD market is now totally dominated by premium brands selling premium models, with the rest of the market fought over by low cost drives, like the ARC 100. Given that the actual difference between SSDs in average daily use is near enough equal, these drives are a great way to add fast capacity for relative peanuts.

Ben Mansill

OVERALL



Corsair Neutron XT SSD 240GB

\$220 • www.corsair.com

Corsair has entered an SSD market that's saturated with brands and models, with little to differentiate. Ever the image-proud company, Corsair is playing at the top end, with its new Neutron XT SSDs, up against the best Samsung, SanDisk and Intel have to offer.

Raw speed is the target, and that's borne out clearly by the choice of Phison S10 controller, which is a quad-core chip used so far only by Phison-branded drives, which are as good as invisible in the market. The memory is Toshiba A19nm, exactly the same as used in the budget OCZ drive opposite, and proving that the controller is everything when it comes to performance.

Corsair claim 560MB/s read and 540MB/s write, which is at the upper limit of what is possible through SATA III. In testing we achieved a more modest 483MB/s read and 411MB/s write, but as mentioned opposite, your SATA controller will vary your mileage. If a few dollars more is less important than top performance, it's a stellar SSD.

Ben Mansill

OVERALL



Antec

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P100

P380

P280

www.antec.com.au



Workstation PCs

NEED MORE GRUNT THAN A STANDARD PC CAN OFFER? WE TEST SEVEN OF THE MOST POWERFUL RIGS ON THE PLANET



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Most of us don't need a huge amount of computing power in our day-to-day working lives. For many, a lightweight, low-powered laptop, even a Chromebook, is good enough. But for some only the best will do. Anyone whose job involves digital content creation - video editors, 3D designers, architects, photographers - will need a higher grade of hardware.

In many cases, this means a workstation: a powerful, specialised desktop PC (or even a laptop) designed for professional tasks. When purchasing one, however, the devil is in the detail. The software you plan to use will dictate the components worth spending money on.

Some activities benefit from more processor cores; some from a faster processor frequency; some from extra memory; and some get a major boost from expensive 3D graphics acceleration. A fast hard disk is essential for video editing, but less crucial for other applications. In this Labs, we'll be looking at a range of workstations that represent a

cross-section of what's available for many of these intensive tasks.

3D MODELLING AND RENDERING

3D animation is one of the most important types of professional activity for which a specialised workstation is needed. The work is divided into two areas, each with different requirements.

Modelling – the process of designing and building 3D objects and characters – is an interactive activity that requires the greatest real-time responsiveness available. However, modelling software isn't generally highly multithreaded, so a fast CPU clock speed is more beneficial than the greatest possible number of cores.

On the other hand, the software used to render models and animations – in other words, to produce the finished article – is among the most multithreaded you can find, so the more cores the merrier. Since processors with a greater number

“workflow fluidity can have a huge impact on the economic viability of your business”

- 1 Workstations specialising in 3D rendering commonly sport two CPUs, since the software works best with as many cores as possible
- 2 Professional-level graphics cards are expensive, but necessary if you're working with high-end engineering or 3D modelling applications
- 3 The big-name brands are more likely than smaller companies to offer chassis designs with tool-free features. The blue tabs inside this Dell allow you to replace the hard disks, power supply and graphics card without a screwdriver



HOW WE TEST

In order to give the broadest possible workstation advice, we've used a wide variety of software for testing. Our Real World Benchmarks suite assesses the general speed at which the system runs Windows, how good it is at running more than one application simultaneously, and how it runs a selection of common media tasks including video and 3D rendering.

In addition to this, we run tests specifically aimed at higher-end workstation activities. To test 3D modelling, we use SPECviewperf 12, which runs a number of tests representing graphics content and real-world behaviour from a number of popular 3D, engineering and medical applications. Maxon Cinebench R15 contains another OpenGL modelling test, alongside a highly multithreaded 3D-rendering test, which benefits greatly from multiple processor cores. We also test GPU-accelerated 3D rendering with the Nvidia CUDA-orientated Bunkspeed Shot and OpenCL-powered LuxMark 2.

We test the raw performance of the storage subsystem with ATTO's Disk Benchmark. Image-editing performance is assessed using DxO OpticsPro 10 running a gruelling noise-reduction process across multiple raw images. Video editing is tested using our standard Sony Vegas test, but with 4K video files instead of HD.

In the case of the Apple Mac Pro, which doesn't run Windows out of the box, we ran every test we could using OS X, including Maxon Cinebench R15, LuxMark 2 and DxO OpticsPro 10. The remainder of our test suite was run on Windows 8.1 under Boot Camp.

of cores are generally clocked more conservatively than those with fewer, modelling and rendering benefit from different types of processor.

While a fast professional graphics card is a boon for modelling, not all rendering software can harness the power available. In other words, there's no need to spend extra on expensive graphics unless you use software that can take full advantage of it. In this case, there's a further choice to make, between the types of GPU acceleration available. Only Nvidia's cards offer CUDA acceleration, while both Nvidia and AMD accelerate OpenCL (see The workstation graphics question, p54).

In practice, the systems in a small 3D-content-creation company or independent artist's studio will need to be able to handle modelling and rendering. Only larger companies can afford to set up machines dedicated to each task: a dedicated farm of servers for rendering, and workstations for modelling. We have examples of both approaches in this month's Labs.

PHOTO AND VIDEO EDITING

Photo editing benefits from a fast processor and plenty of RAM, but doesn't usually gain much from multiple cores or a high-end graphics card. However, some software – including the DxO OpticsPro 10 application we used for

testing – can be accelerated via utilising CUDA or OpenCL.

Video editing may gain from multiple cores as well as clock speed, but the software you use will dictate whether the graphics card is of any benefit. Sony Vegas supports OpenCL, and Adobe Premiere Pro's Mercury Playback Engine can benefit from Nvidia's CUDA acceleration. Keep in mind that the benefits of this acceleration apply only to certain activities, not across the board. Perhaps a more important consideration with video is the huge amount of hard disk space the files occupy. And, with data rates for 4K footage pushing past the 100Mbps/sec mark even when the video is compressed, the disks need to be as fast as possible too.

MAINTENANCE CONCERNS

Of course, it isn't all about performance. In this Labs we've focussed on mainstream big brands Apple, Lenovo, Dell and HP, being more likely to offer clever chassis designs that are easier to upgrade and maintain, or that are smaller, quieter and easier to live with than a large unwieldy box.

Above all, bear in mind that workflow fluidity can have a huge impact on the economic viability of your business, and a fast, reliable workstation tailored to your specific needs can make all the difference in the end.

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The workstation graphics question

WHY DO MANUFACTURERS CHOOSE A PROFESSIONAL GRAPHICS CARD WHEN CONSUMER-GRADE EQUIVALENTS ARE SO MUCH CHEAPER?

Not all of this month's workstations incorporate Intel's professionally orientated Xeon processors, and those that don't gain considerably from the Core i7's more flexible clock speed. But every single system in this Labs has opted for professional-grade graphics.

If you follow the 3D graphics business, you'll be aware that, while professional and consumer CPUs are quite different these days, most professional graphics cards have a fairly close equivalent in the consumer range.

With professional graphics usually costing at least twice as much as the consumer-grade alternative, it would seem an obvious economy to opt for consumer-grade graphics as well as a consumer-grade CPU. But few manufacturers do this, and certainly none of the manufacturers featured in this month's Labs. Why is this?

WARRANTY AND CERTIFICATION

Manufacturers often quote "workstation optimisation" to justify the price difference between consumer and professional graphics cards. Products in the AMD FirePro and Nvidia Quadro ranges come with longer warranties – usually three years instead of two, or even one. The cards are also tested with a wide range of professional applications, and come with certifications of compatibility with common design and engineering software. This in turn means that, in theory at least, the hardware vendor will

be able to provide technical support and bug fixes to ensure you get your chosen application working as it should, which is fundamentally important when you're on a deadline.

There's greater deviation between consumer and professional cards as you move up the Quadro and FirePro ranges. Each is topped by models with huge memory allocations: the AMD FirePro W9100 with a whopping 16GB of GDDR5, and the Nvidia Quadro K6000 with 12GB of GDDR5. No current consumer card can match that. In fact, these cards are aimed at different markets to the products further down the range – for example, engineering and medical imaging, which requires huge texture sets. However, you do pay for the privilege: the former card costing more than \$5,000, and the latter \$6,000 plus.

THE USUAL CONTENDERS

The focus on professional graphics in workstations means that there aren't many options available. Professional cards follow the manufacturers' reference design, so there's no variation in clock speed between models using the same type of GPU.

Indeed, all of this month's entries use PNY cards. The Labs-winning HP Z640 uses the PNY-branded Nvidia Quadro K4200, which is currently the mainstream power choice. This has 1,344 CUDA cores and 4GB of 5.4GHz GDDR5 memory.



▲ The Mac Pro is one of only two workstations this month with AMD graphics cards

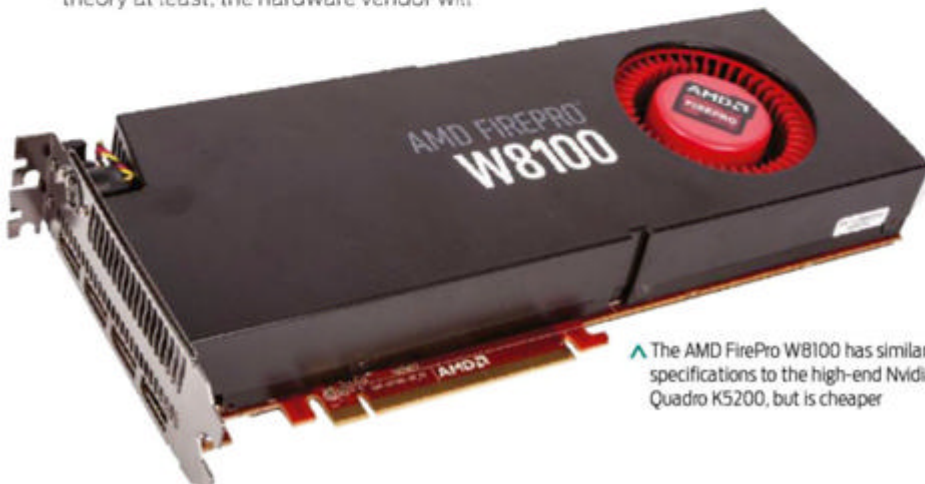
Only Lenovo has opted for the lower-end Quadro K2200, which still has 4GB of GDDR5, but clocked at a slower 5GHz, and with only 640 CUDA cores. Dell has ventured in the opposite direction and chosen the higher-end K5200, which doubles the memory complement to 8GB of GDDR5, running at 6GHz, and ups the core count to 2,304, promising hugely impressive 3D performance.

Only Apple has deviated from the Nvidia norm. The Apple Mac Pro comes with twin AMD graphics cards, in this case D700s, each with 2,048 stream processors and 6GB of 5.5GHz GDDR5. Although the Nvidia Quadro range has become more popular recently for professional workstations, AMD cards still have plenty to offer, and for some applications can be the better choice.

3D GRAPHICS AS COPROCESSOR

Separate to the issue of professional versus consumer graphics, the GPU has morphed over the past few years from a single-purpose 3D accelerator to a much more general coprocessor. GPU power became more generic with the advent of the unified shader model in 2006, which opened up the possibility for what is sometimes called GPGPU – general-purpose computing on graphics processing units.

In short, any software task that involves massively parallel calculations can



▲ The AMD FirePro W8100 has similar specifications to the high-end Nvidia Quadro K5200, but is cheaper



Adobe's Mercury Playback Engine, as used in Premiere Pro CC, includes some CUDA-accelerated effects

“Nvidia and AMD have taken radically different strategies towards implementing GPGPU”

benefit from the processing power of a GPU. Scientific and financial modelling are potential recipients of these benefits, as is offline 3D rendering using ray tracing; an increasing number of applications in other areas are also now building in support.

Unfortunately, in a situation that reflects the fierce competition between Nvidia and AMD, the two companies have taken radically different strategies towards implementing GPGPU acceleration. Nvidia's preferred method is CUDA, a proprietary technology that it doesn't license to other hardware companies, so AMD graphics cards aren't compatible. Software must be written specifically to support CUDA, such as the Bunkspeed Shot software we've used for testing, or Adobe's Mercury Playback Engine.

AMD, meanwhile, has put its weight behind OpenCL. This is intended to be an open standard for GPGPU acceleration, in the same way that OpenGL is for graphics. Both AMD and Nvidia graphics cards provide hardware OpenCL acceleration, and you can install drivers so Intel and AMD processors support it too. The LuxMark 2 OpenCL rendering test we used this month can be run on GPU, CPU or both. Sony's Vegas Pro has OpenCL acceleration as well as CUDA support.

In reality, there's a blur between CUDA and OpenCL. Many of Adobe's

applications have CUDA support for a range of features, but not OpenCL. Autodesk Maya, on the other hand, harnesses CUDA for greater scene complexity, but empowers its physics simulations with OpenCL. Avid sides with CUDA, but Blackmagic's popular DaVinci Resolve video-grading application can utilise either. And while the Foundry's Nuke and Mari video-compositing software is exclusively accelerated by CUDA, Apple's Final Cut Pro X, in turn, relies on OpenCL.

CUDA OR OPENCL?

There's still much more potential to be tapped from GPGPU, with current software only scratching the surface of what's possible. To gain the most benefit, however, it's clear you need to take into account the software you plan to use, and

how well it is optimised for each of the two vendors.

Since Nvidia Quadro GPUs support OpenCL as well as CUDA, they would seem like the obvious choice for maximum flexibility. However, as our tests this month have shown, AMD's FirePro cards are significantly more efficient with OpenCL. You'll need an Nvidia Quadro to make the most of CUDA software, and they're also the best option for software that uses both platforms – but any software using OpenCL extensively will run better with a FirePro.

It may even be cost-effective to have a secondary GPGPU device dedicated to CUDA or OpenCL acceleration. Nvidia has created a range of cards specifically for this purpose called Tesla, while AMD has its Stream range. However, any additional graphics cards can be harnessed alongside the main one for GPGPU activities. Although graphics card companies would like you to buy their expensive professional models, consumer-grade graphics have become popular in this role, since software compatibility is less of an issue.

We don't have any examples of this trend this month, although Apple's Mac Pro includes pairs of AMD FirePro cards, with the second card targeting OpenCL.

Despite that, and the huge potential of the technology, GPGPU operation currently remains rather niche, evidence of which can be seen in this month's group of workstation machines: the majority have only single Nvidia Quadro graphics cards installed inside.



Apple's Final Cut Pro X is OpenCL-accelerated, so AMD hardware will provide the most benefit



	Apple Mac Pro (late 2013)	Dell Precision T7810	RECOMMENDED HP Z640	Lenovo ThinkStation P500
OVERALL	★★★★★	★★★★★	★★★★★	★★★★★
INFORMATION				
Price	\$6,219	\$13,599	\$18,999	\$3,026
Manufacturer	apple.com/au	dell.com/au	hp.com/au	lenovo.com/au
Delivery	Free	Free	Free	Free
Warranty	1yr	3yr	3yr	3yr on-site NBD
CORE COMPONENTS				
Processor (max clock speed)	3GHz Intel Xeon E5-1680 v2 (3.9GHz)	2 x 2.3GHz Intel Xeon E5-2650 v3 (3GHz)	2 x 3.2GHz Intel Xeon E5-2667 v3 (3.6GHz)	3.5GHz Intel Xeon E5-1620 v3 (3.6GHz)
Total cores/threads	8/16	20/40	16/32	4/8
Expansion slots (number free for expansion)	4 x RAM slots (0); 2 x PCI-E x16 (0)	8 x RAM slots (4); 2 x PCI-E x16 (1); PCI-E x8 (1); PCI-E x4 (1); PCI-E x1 (1); PCI (0); 6 x SATA 600 (3)	8 x RAM slots (0); 2 x PCI-E x16 (1); PCI-E x8 (1); PCI-E x4 (0); PCI (0); 4 x SATA 600 (4); 4 x SAS (2)	8 x RAM slots (4); 2 x PCI-E x16 (1); 2 x PCI-E x4 (2); PCI-E x1 (1); PCI (1); 6 x SATA 600 (4)
RAM fitted, type and speed	32GB, DDR3 1,866MHz	32GB, DDR4 2,133MHz	64GB, DDR4 2,133MHz	16GB, DDR4 2,133MHz
Graphics card (RAM)	2 x AMD FirePro D700 (6GB GDDR5, 5.5GHz)	PNY Quadro K5200 (8GB GDDR5, 6GHz)	PNY Quadro K4200 (4GB GDDR5, 5.4GHz)	PNY Quadro K2200 (4GB GDDR5, 5GHz)
Video outputs	HDMI; 6 x ThunderBolt 2	2 x DisplayPort 1.2; 2 x DVI-D DL	2 x DisplayPort 1.2; DVI-D DL	2 x DisplayPort 1.2; DVI-D DL
DRIVES				
SSD (connection type)	512GB Samsung XP941 (PCI-E M.2)	250GB Samsung 840 Evo (SATA 600)	512GB Micron M550 (SATA 600)	240GB Intel SSD Pro 1500 Series (SATA 600)
Hard disk	N/A	1TB WD WD10EZEX (7,200rpm, 64MB)	300GB Seagate Cheetah 15K.7 (15,000rpm, 16MB)	N/A
Optical drive		DVD writer	DVD writer	DVD writer
CASE & CONNECTIONS				
Model (dimensions WHD)	Apple Mac Pro (167 x 167 x 251mm)	Dell Precision T7810 (173 x 472 x 414mm)	HP Z640 (175 x 465 x 445mm)	Lenovo ThinkStation P500 (175 x 470 x 440mm)
PSU make and model (power output)	Apple (450W)	Dell H825EF-02 (825W)	HP D12-925P1A (9250W)	Lite-On (650W)
Rear ports ¹	2A; 2G; 1H; 6T2; 4U3	2A; 1G; 2PS/2; 3U2; 3U3; serial	2A; 1G; 2PS/2; 1SR; 2U2; 4U3	3A; 1G; 2PS/2; 4U2; 4U3; serial
Front/top ports	None	2A; 3U2; 1U3	2A; 4U3	1A; 4U3; SD slot
SOFTWARE				
Operating system	OS X 10.10	Windows 7 64-bit	Windows 8.1 64-bit	Windows 7 64-bit

Apple Mac Pro (late 2013)

A BEAUTIFUL PIECE OF ENGINEERING FROM APPLE, AND BRILLIANT FOR SOME USES - BUT VERY EXPENSIVE

It's easy to fall in love with the Apple Mac Pro's dinky cylindrical chassis, which will sit happily next to your monitor without spoiling your working environment. Yet its attractive exterior hides a surprisingly powerful set of components: it can be specified up to a 12-core Intel Xeon processor, 64GB of RAM, 1TB of flash storage and dual graphics cards. Our sample was the mid-range eight-core model, using an Intel Xeon E5-1680 v2, offering 16 virtual cores. The native clock speed is 3GHz, and with a top Turbo Boost frequency of 3.9GHz, it's good for raw speed as well as parallel processing.

It's from the Ivy Bridge era, so it supports only DDR3 rather than the latest DDR4 memory, but Apple has supplied 32GB of fast 1,866MHz DIMMs. These occupy all four slots, so there's no room for upgrade.

Graphics provision is exceptional. The Mac Pro incorporates two AMD FirePro D700 graphics cards, each with 6GB of

✓ It's easy to fall in love with the elegant cylindrical chassis of the Mac Pro

GDDR5 memory running at 5.5GHz and 2,048 stream processors. This offers hefty acceleration for 3D and OpenCL applications. On the downside, the proprietary case means that you can't upgrade them with off-the-shelf cards.

The Mac Pro opts for PCI Express-connected solid-state storage, with a 512GB drive included. This provides outstanding peak throughput of more than 1GB/sec, but there's no secondary storage option inside. The Mac Pro is intended for use with a Bluetooth keyboard and mouse, so all four USB 3 ports are free. There are six Thunderbolt 2 ports, as well as HDMI, so it isn't lacking expansion in connectivity.

While the Mac Pro is powerful for its size, performance is disappointing. Its Real World Benchmark result of 1.21 is average.

Its Sony Vegas 4K video export was also mediocre, and while the dual D700 graphics are great for OpenCL, they produced the lowest Maxon Cinebench R15 OpenGL score of 85fps. A strong DxO OpticsPro result of 41 seconds implies that the Mac Pro's forte is 2D design rather than 3D content creation.

In light of these results, the price is hard to justify. All the same, the sheer elegance of the Mac Pro makes it a machine impossible to dislike.

KEY SPECS

\$6219 · www.apple.com.au

OVERALL



Dell Precision T7810

A GREAT WORKSTATION FOR ENGINEERING, WITH 40 VIRTUAL CORES AND 32GB OF DDR4 RAM

The Dell Precision T7810 on test this month is configured primarily for use with engineering software, rather than for content creation. As such, it uses a pair of ten-core Xeon E5-2650 v3 processors, which major on core count rather than frequency: they run at a nominal 2.3GHz, hitting 3GHz in Turbo Boost, but Hyper-Threading yields an enormous 40 virtual cores for parallel-processing tasks.

Dell compensates for the low clock speed by including an Nvidia Quadro K5200. With 8GB of 6GHz GDDR5 memory and 2,304 CUDA cores – 960 more than the K4200 – this is a hugely powerful GPU. The Xeon processor also supports DDR4 memory, and Dell has equipped the T7810 with 32GB of the 2,133MHz variety. The four 8GB DIMMs leave four slots free.

Dell takes the usual two-pronged route when it comes to storage. The SSD supplied for the operating system and applications is a merely adequate SATA-connected 250GB Samsung 840 Evo, and the 1TB WD Blue 7,200rpm hard disk for general storage is reasonable at this price.

The chassis isn't exactly brimming with extra drive bays, either, with only one 5.25in bay free for upgrades. And while the case has a spacious layout, with some tool-free

component-swapping abilities, the HP Z640 and Lenovo ThinkStation P500 have much more potential for expansion.

The T7810's emphasis on engineering performance leads to a mixed bag of results. Its Overall score of 1.04 in our Real World Benchmarks was the lowest on test, thanks to poor Media and Windows scores. The Maxon Cinebench R15 rendering score of 1,845 was clearly dragged down by the relatively low speed the cores run at when they're all in use. This affected

photo and video editing as well, with a rather mediocre result of 52 seconds in DxO OpticsPro and a lacklustre Sony Vegas 4K export. However, the high-end graphics card gave the Dell an excellent overall result of 18 seconds in the CUDA-powered Bunkspeed Shot render, and 2,364 combined in the LuxMark 2 OpenCL test. The SPECviewperf results were the most telling of all, with a joint-best Maya result of 64fps, and the joint-top score of 102fps in the SolidWorks test. Apart from this and the Autodesk Showcase score, the Dell was the quickest in all the other SPECviewperf 12 viewsets, most of which simulate engineering and medical applications, showing the T7810's strength in these areas.

We can't question the Precision T7810's appropriateness for the intended engineering user, nor for 3D content creation with certain software, including Autodesk Maya. However, this isn't one to consider as a general-purpose workstation.



◀ The chassis is very well made, although it isn't bursting with extra drive bays

KEY SPECS

\$13,599 • www.dell.com.au

OVERALL



Lenovo Think Station P500

COUPLES BRILLIANT CHASSIS DESIGN WITH LOW-POWER COMPONENTS TO DELIVER A KEENLY PRICED SYSTEM

IBM farmed off its server brands to Lenovo last year, but thankfully it's been business as usual in terms of quality. The ThinkStation P500 is evidence of this, rivalled only by the HP Z640 for tool-free access. The inside is littered with red flashes showing where to pull to release components, which slide out in a matter of seconds.

Our review sample didn't have the most impressive specifications, however. Its Xeon E5-1620 v3 is the bottom of the new Haswell Xeon E5 range, with a nominal clock speed of 3.5GHz, rising to only 3.6GHz in Turbo Boost. It's a quad-core CPU, so Hyper-Threading provides only eight virtual cores, where the top systems offer 40. There is support for DDR4 memory, though, and there's 16GB of 2,133MHz RAM included, spread across four DIMMs with four slots free.

The graphics card isn't impressive, either. The PNY-branded Nvidia Quadro K2200 is a capable 3D accelerator, with a sizeable 4GB of GDDR5 memory and 640 CUDA cores. However, it nowhere near as powerful as others in this Labs, some of

which offer three times the CUDA cores and twice the memory.

Primary storage is taken care of by a 240GB SATA-connected Intel SSD Pro 1500 Series SSD. This will be adequate for your OS and software, and performance is on a par with other SATA-connected SSDs this month, but it isn't exactly generous. Lenovo didn't include a secondary disk, but there are three easily accessible 3.5in tool-free drive bays empty should you wish to

add one yourself. The P500's entry-level components left it with the second-lowest score in our Real World Benchmarks, with a result of 1.1. Its Maxon Cinebench R15 rendering score of 711 was at the bottom of the table, and only the Apple Mac Pro was slower for the OpenGL preview portion of Cinebench R15.

The Lenovo also posted the slowest score of 1min 17secs in our DxO OpticsPro test, and took 2mins 57secs to output the 4K video in our Sony Vegas benchmark. We couldn't enable GPU acceleration in Bunkspeed Shot, but OpenCL results with LuxMark 2 were reasonable considering the specification. The SPECviewperf 12 results weren't great though, with only the Mac Pro pipping the P500 to bottom place in two of the tests.

It would be unfair to mark the ThinkStation P500 down too much, since most of its rivals this month are far more expensive. The chassis design is excellent, and with the right components it could be very capable.



Unfortunately, the Lenovo's low price is reflected in its entry-level specs

KEY SPECS

\$3026 • www.lenovo.com.au

OVERALL



Shuttle's fanless Ultra-slim PC delivers on connectivity

Slim PC
XS35V4



Slim PC
XS36V4



Shuttle's new cost-effective XS35V4 and XS36V4 slim PCs are equipped with an Intel® Bay Trail processor for low-power consumption and energy saving. The series feature compact size and fanless design to ensure long-term stable and silent operation. With multiple I/O interfaces, both support great peripheral connectivity for business applications, including thin client and ultra-slim desktop.

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HP Z640

A HUGE POWERFUL WORKSTATION WITH AN EXCELLENT TOOL-FREE DESIGN - BUT IT'S PRICEY

HP's Z640 is the second most expensive workstation on test this month, and in many areas the most highly specified. Sporting a pair of Intel Xeon E5-2667 v3 processors, it offers 32 virtual cores with Hyper-Threading enabled, second only to the Dell Precision T7810 and the Workstation Specialists RS-D render node. HP's processors are faster, though, with a nominal frequency of 3.2GHz, boosting to 3.6GHz in Turbo Boost.

Since the Xeon is from the latest Haswell generation, it supports DDR4 memory, and HP has installed 64GB of 2,133MHz DIMMs. Surprisingly, the manufacturer hasn't opted for a top-of-the-range graphics card: the PNY Quadro K4200 is no slouch, but a K5200 would have been a better match for the rest of the specification.

Although PCI Express solid-state storage is an option for the Z640 (HP's "Z Turbo Drive"), this model uses a conventional SATA SSD as primary storage. The 512GB capacity is generous, but performance is way behind the M.2 drive in the Apple entry.

Strangely, rather than installing a large 7,200rpm conventional hard disk for data storage, HP has opted for a 15,000rpm SATA disk with only 300GB of capacity. This is the quickest non-SSD on test, but it won't be enough space if you're planning to work with large amounts of video, particularly 4K. However, like other blue-

chip vendors here, HP has created a tool-free chassis design that will make it easy to add storage further down the line.

The HP's dual eight-core CPU configuration gave it an excellent rendering score in Maxon Cinebench R15. It achieved the quickest result of 31 seconds in Dxo OpticsPro, and the overall

Bunkspeed Shot result of 14 seconds was top of the pack, too. The 4K video export in Sony Vegas took 1min 15secs.

The HP's Cinebench R15 modelling ability was good, too, with a result of 159fps. Its SPECviewperf 12 results were more varied: the Maya result of 55fps is in the same ballpark as other Quadro K4200-equipped systems, but behind Dell's K5200. The SolidWorks result of 87fps is similarly in the middle of the pack.

The HP Z640 is a super-powerful workstation, but it's on the pricey side. It's great for tasks such as rendering that can take full advantage of the many cores available, and it would also be great for photo and video editing. However, 3D-modelling abilities with some applications are below what we'd expect of a machine at this price, and so it misses out on a Best Value award.



◀ The HP's chassis looks understated, but it's brilliantly designed

KEY SPECS

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OVERALL



View from the Labs

THE DESKTOP PC MARKET MAY BE STAGNATING, BUT THE WORLD OF SUPER-POWERFUL WORKSTATIONS HAS NEVER BEEN MORE INTERESTING, SAYS **JAMES MORRIS**

In some of the areas of the computing world, PCs have become capable enough for most things we want to do with them. But the professional user remains hungry for powerful new technology that will enable more complex work, quicker production times, and the opportunity to realise ever more sophisticated creative ideas in the shortest time possible.

The broad selection of machines in this month's Labs is ample evidence that this sector of the PC market is in rude health. At one end of the spectrum we have the Apple Mac Pro, which packs a huge amount of power into an unfeasibly small and delectably shaped package. At the other, we have the overbuilt chassis of the HP Z640.

And where the market for consumer desktop PCs is in the doldrums, there are plenty of interesting developments in the workstation sector.

Chassis design, perhaps influenced by the arrival of the Mac Pro, is undergoing

a renaissance, and it isn't only the blue chips involved; others are beginning to up their game, too.

This isn't the only area that's developing apace. After years of domination, the dual-socket workstation is beginning to give way to the more flexible, multi-core, single-socket PC ready to take its place. Now that Xeons are sporting up to 18 cores, the need for more than one processor is fast receding. The 18-core Xeon is prohibitively expensive, and was reportedly designed as a special edition for Google, but

the performance of the single-socket machines this month proves that two CPUs are no longer better than one. The 14-core Xeon E5-2697 v3 is a good match for the pair of eight-core CPUs, while being cheaper and requiring about half the overall power.

The other major trend is one the big manufacturers have yet to join in with: a move towards employing



instead of workstation-specific Xeons. An overclocked Core i7, with potent liquid cooling and a full warranty, is an excellent choice for certain types of workstation activity, particularly modelling.

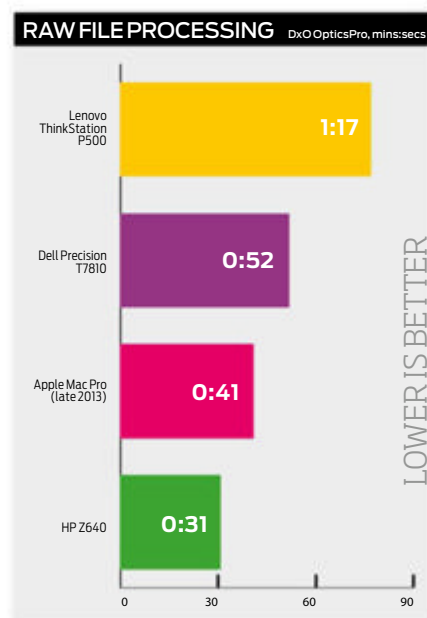
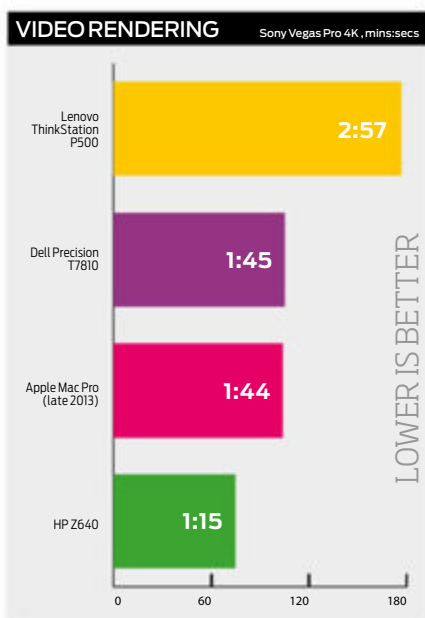
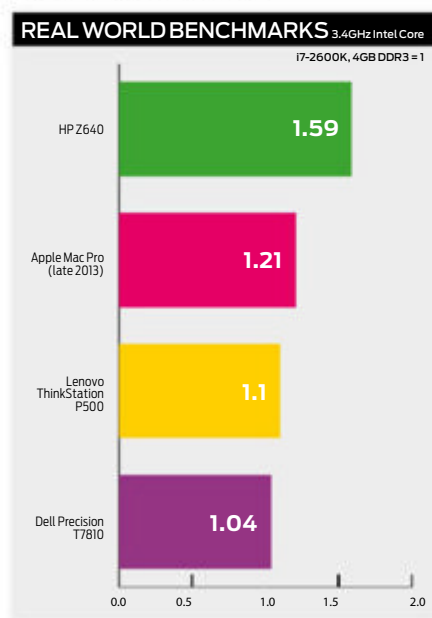
We love the chassis design of HP's Z640 and Lenovo's ThinkStation P500 that combines it all in one competitively priced package. Although, as we highlighted at the beginning of this Labs, it's difficult to master every type of workstation activity that takes place at the same time. ●



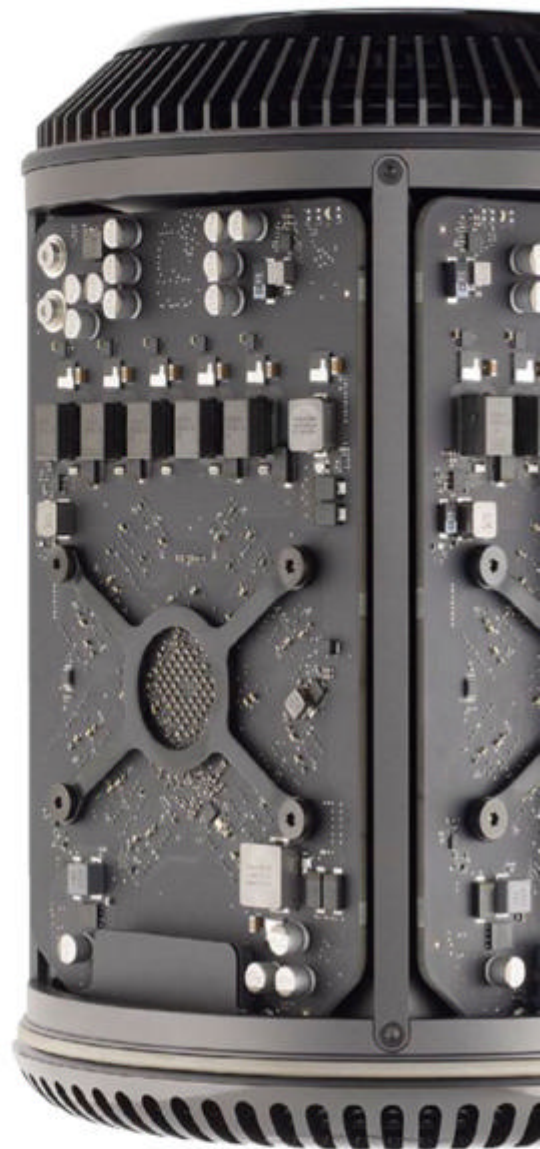
RESULTS

The coloured graphs at the bottom of these two pages provide an at-a-glance overview of how the systems performed. If that's not enough for you, the table to the right delivers a full breakdown of the results each workstation achieved.

Test results

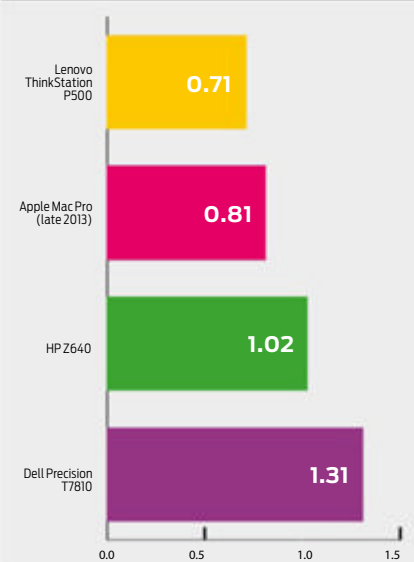


	Apple Mac Pro (late 2013)	Dell Precision T7810	HP Z640	Lenovo ThinkStation P500
REAL WORLD BENCHMARKS, 3.4GHZ INTEL CORE I7-2600K, 4GB DDR3 = 1				
Overall	1.21	1.04	1.59	1.1
Multitasking	1.35	1.48	2.3	1.1
Windows	0.95	0.77	0.96	0.99
Media	1.33	0.86	1.51	1.17
CINEBENCH R15				
CPU, synthetic score	1,165	1,845	2,602	711
OpenGL, fps	85	152	159	115
SPECVIEWPERF 12, FPS				
catia-04 (CATIA)	47	87	66	43
creo-01 (Creo)	27	70	52	36
energy-01 (Energy)	3.11	3.83	3.12	2.83
maya-04 (Maya)	41	64	55	37
medical-01 (Medical)	22	30	21	15
showcase-01 (Showcase)	40	49	37	22
snx-02 (Siemens NX)	52	82	63	32
sw-03 (SolidWorks)	44	102	87	72
BUNKSPEED SHOT, GRAFFITI BENCHMARK, SECONDS				
GPU	N/A	17	28	Did not finish
CPU	56	29	20	70
Overall	N/A	18	14	70
LUXMARK 2 SALA OPENCL				
GPU	3,767	1,651	960	1,005
CPU	1,032	704	992	567
Overall	4,155	2,364	1,917	1,501
SSD AND HDD SPEED TESTS (ATTO), MB/SEC				
SSD 4K read	128	282	88	52
SSD 4K write	119	281	157	144
SSD 2048K read	1,011	564	530	553
SSD 2048K write	982	441	455	519
HDD 4K read	N/A	101	170	N/A
HDD 4K write	N/A	98	161	N/A
HDD 2048K read	N/A	184	208	N/A
HDD 2048K write	N/A	178	208	N/A



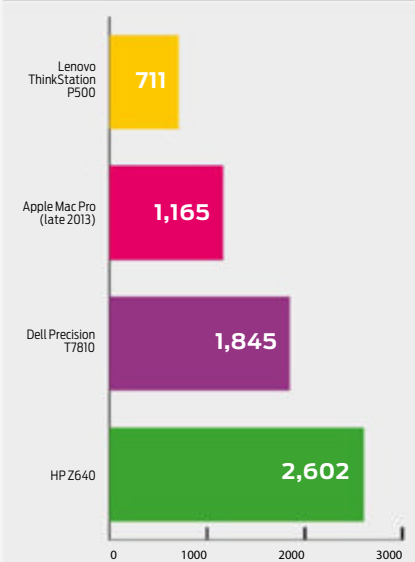
3D MODELLING

SPECViewperf 12, relative scores



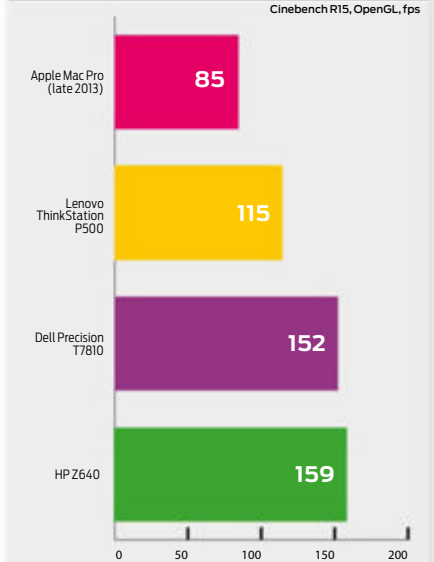
3D RENDERING

Cinebench R15, CPU, synthetic scores



GRAPHICS CARD PERFORMANCE

Cinebench R15, OpenGL, fps





Chipping in: Processors

A GREAT PROCESSOR IS ABOUT MORE THAN THE SPECS YOU SEE ON PAPER. WE TEST EVERY MAJOR CPU FROM AMD AND INTEL TO FIND THE BEST ONE FOR YOUR SYSTEM

Building your own PC means you get to choose exactly the components you put in it. While you may not save money doing so, you know you'll have a computer that matches your needs using quality components.

The processor, or CPU, is just about the most important component in a computer, dictating how fast it is and the type of applications that it will run. Here, we've tested every major AMD and Intel processor to help you make that choice. We've ditched older lines of processors that aren't commonly available, as the few models that are left tend to be a false economy in the grand scheme of things.

INTEL OR AMD?

You should choose your processor first – AMD or Intel – as this will dictate the type

of motherboard you need. Once you've chosen your chip, you can choose your motherboard based on the processor socket and chipset that you need.

Processor prices fluctuate, so it's worth checking prices of other models as well as our award winners to see if they're a better bargain overall.

DUE CORES AND ATTENTION

Although the architecture of each CPU varies (our reviews explain more), all models share certain features. Understanding these will help you make the right choice and choose the best one for your needs.

A processor's clock speed is given as an indication of its performance, but it is not the only factor. In fact, it's often misleading, and clock speed is only a useful gauge

when you are comparing processors in the same range.

More important is how many cores a chip has. A core is a processor in its own right, so the more cores there are the better performance your computer has at its fingertips. To use multiple cores you either have to run multiple applications at once, or use applications that take advantage of them. The latter are called multithreaded applications, and are typically for processor-intensive tasks such as video editing, as a famous example.

Multithreaded support has become better in recent years, with applications able to use eight cores easily.

Even if you don't run a lot of these types of application, multiple cores are useful: you can run a virus scan using one core, while the others are used for web browsing and other tasks. All the processors we've reviewed have at least two cores, but quad-, six- and even eight-core CPUs are also here.

Some Intel processors use the company's Hyper-Threading technology, which doubles the number of cores available by adding one logical core per real core. Virtual cores help speed up applications and let the processor do more, making it more efficient, but they're not as good as real physical cores.

Some processors here (our table confirms which ones) can automatically overclock themselves when they're cool enough. This means you get a speed boost for free. Intel calls its technology Turbo Boost; AMD calls its version Turbo Core.

COLD HARD CACHE

All computers have system memory (RAM), which is used to store open applications and data. However, it tends to be relatively slow; that is, too slow for a CPU. This is why processors have cache. L1 cache is the fastest type, and smallest, and each core has its own. L2 cache is available in larger sizes and is not quite as quick as L1. Each core generally has its own L2 cache, though some models share this between multiple cores. Finally, L3 is the slowest type, but is available in much bigger sizes. It's shared between all cores.

When a core needs to access something from memory, it first checks the L1 cache, then the L2 cache and then the L3 cache, only going to system memory if it can't find what it wants. The amount of cache, therefore, has a significant impact on performance, as it reduces the time that a processor has to wait for system memory. The more L3 cache you have the better, as cores often have to access the same L3 cache data, so having shared cache helps speed up all the cores.

GATHERING INTEL

We've reviewed three ranges of Intel processors in this group test. The vast majority of these are Haswell processors. These fit into motherboards with the LGA1150 socket and will work with any of the matching motherboards we've reviewed; take care as they will not work with all old boards.

Next we have Devil's Canyon processors, which are an update to Haswell and improve the chip's cooling, so that they can be clocked at faster speeds. These require Z97 or H97 motherboard chipsets. Both Devil's Canyon and Haswell processors have integrated graphics, so you don't have to buy a dedicated graphics card if you're not into playing games.

Haswell chips come in the following ranges: Pentium, which are dual-core; and Core i3, which are dual-core with Hyper-Threading. Haswell and Devil's Canyon both have Core i5 models, which are quad-core and have Turbo Boost, and Core i7 chips, which are quad-core with Hyper-Threading and Turbo Boost.

Finally, there are Haswell-E chips, which use the LGA2011 socket. These are Intel's high-performance processors and are either six- or eight-core with Hyper-Threading and Turbo Boost. These chips do not have integrated graphics chips.

In all cases look out for chips with a 'K' in the name, as these have unlocked multipliers, allowing you to overclock them more easily.

SPECIAL FX

AMD's processors are available as two types: those with graphics and those

without. The latter are all FX chips and are designed for AM3+ motherboards. Cheaper FX chips are quad-core, but the more powerful chips have six or eight cores. The current FX generation is known as Piledriver and uses Vishera cores. Look out for these, as they're superior to the earlier Bulldozer chips with their Zambezi cores, which we haven't reviewed here.

FX chips can't match the fastest Intel processors for raw power, but they're a lot cheaper and, per dollar, outperform their arch rivals. The six- and eight-core models are great chips for serious computing tasks, and very good value.

AMD ARCHITECTURE

All FX processors have unlocked multipliers, meaning you can overclock them easily if you're feeling adventurous and want some additional performance.

All the other AMD processors we've tested are called Application Processing Units (APUs), which means they combine graphics with a processor. There are three generations of A-series (processors

starting with an A) APUs on the market. Trinity and Richland can both be used in Socket FM2 motherboards, while the newer Kaveri processors require an FM2+ motherboard.

A-series chips aren't anywhere near as powerful as equivalently priced Intel chips or the FX range, but their integrated graphics are very good. All but the cheapest processors can manage our Dirt Showdown benchmark, playing it smoothly at a 720p resolution. This means that you can play some decent games without having to buy a graphics card, making A-series APUs brilliant all-rounders. These chips are either dual- or quad-core.

Finally, there are the newer AM1 chips, which are AMD's budget offering. These require an AM1 motherboard. These chips are slow and the graphics are only really good enough for playing videos.

However, if you're looking to build a small computer for light computing tasks, they're a good option at a very low cost and consume less power..

THE FINAL TOUCHES: RECOMMENDED PSUs, SSDS AND HARD DISKS

To finish your PC, you'll need a PSU, SSD or hard disk. Here's our pick of the best products we've reviewed. We've also listed our recommended RAM; memory has little impact on system performance, but a greater amount is a boon if you work with images or video.

PSUs

MODEL	RATING	PRICE	WEBSITE
Be Quiet! Pure Power L8 530W	★★★★★	\$99	www.bequiet.com
XFX Pro 850W XXX Edition	★★★★★	\$130	www.xfxforce.com
Be Quiet! Dark Power Pro 10 850W	★★★★★	\$300	www.bequiet.com

HARD DISKS

MODEL	RATING	PRICE	WEBSITE
Western Digital Green 1TB	★★★★★	\$79	www.wdc.com
Western Digital Green 2TB	★★★★★	\$110	www.wdc.com
Western Digital Black2 Dual Drive 1TB + 120GB SSD	★★★★★	\$320	www.wdc.com

SSDS

MODEL	RATING	PRICE	WEBSITE
Crucial MX100 256GB	★★★★★	\$149	www.crucial.com
Crucial MX100 512GB	★★★★★	\$289	www.crucial.com
Sandisk Ultra II 960GB	★★★★★	£320	www.sandisk.com

RAM

MODEL	RATING	PRICE INC VAT	WEBSITE
Corsair Vengeance 8GB 1,600MHz DDR3 Memory	NA	\$110	www.corsair.com
Corsair Vengeance 16GB 1,600MHz DDR3 Memory	NA	\$200	www.corsair.com

Intel Haswell

Haswell is Intel's most recent mainstream processor architecture, as the newer Broadwell architecture hasn't been released yet. Fortunately, Haswell is still extremely quick, so there's no reason to hold off buying. All Haswell processors use the LGA1150 processor socket, so you'll need to buy a matching motherboard.

Haswell uses the same 22nm fabrication process as the previous-generation Ivy Bridge architecture. Intel has pushed for speed in this range, but that means they need more power. Both the Core i5 and Core i7 ranges have 84W thermal design power (TDP), while the Core i3 and Pentium Dual Core range draw less power with 54W and 53W TDPs respectively.

ARCHITECTURE

There are five types of Haswell processor, denoted by a model range name. At the low end is the Celeron range, which we haven't reviewed here, as the chips aren't good value. That leaves the budget Pentium, low-end Core i3, mid-range Core i5 and high-end Core i7.

All share the same basic architecture, with 64KB of L1 cache and 256KB of L2 cache per core. The amount of L3 cache, which all cores share, varies from 3MB to 8MB depending on the number of cores and processor type.

With more cache, a processor spends less time accessing slow system memory, speeding up processing. As multiple cores often have to access the same data, more L3 cache is a great way to speed up a PC.

The big differences in processors come from the number of cores they have and whether or not they include Hyper-Threading. Hyper-Threading is Intel's technology for creating virtual cores for

HASWELL					
MODEL	FREQUENCY (TURBO)	CORES	RATING	PRICE	BENCHMARK SCORE
Pentium G3220	3GHz	Two	★★★★☆	\$79	39
Pentium G3420	3.2GHz	Two	★★★★☆	\$83	41
Pentium G3430	3.3GHz	Two	★★★★☆	\$121	43
Pentium G3440	3.3GHz	Two	★★★★☆	\$109	43
Pentium G3450	3.4GHz	Two	★★★★☆	\$98	44
Pentium G3460	3.5GHz	Two	★★★★☆	\$135	45
Core i3-4130	3.4GHz	Two plus two logical (Hyper-Threading)	★★★★☆	\$152	55
Core i3-4150	3.5GHz	Two plus two logical (Hyper-Threading)	★★★★☆	\$159	57
Core i3-4160	3.6GHz	Two plus two logical (Hyper-Threading)	★★★★☆	\$155	58
Core i3-4330	3.5GHz	Two plus two logical (Hyper-Threading)	★★★★☆	\$170	57
Core i3-4340	3.6GHz	Two plus two logical (Hyper-Threading)	★★★★☆	\$218	58
Core i3-4350	3.6GHz	Two plus two logical (Hyper-Threading)	★★★★☆	\$159	58
Core i3-4360	3.7GHz	Two plus two logical (Hyper-Threading)	★★★★☆	\$169	60
Core i3-4370	3.8GHz	Two plus two logical (Hyper-Threading)	★★★★☆	\$180	61
Core i5-4430	3GHz (3.2GHz)	Four	★★★★☆	\$200	88
Core i5-4440	3.1GHz (3.3GHz)	Four	★★★★☆	\$212	91
Core i5-4460	3.2GHz (3.4GHz)	Four	★★★★☆	\$255	94
Core i5-4570	3.2GHz (3.6GHz)	Four	★★★★☆	\$249	94
Core i5-4590	3.3GHz (3.7GHz)	Four	★★★★☆	\$269	97
Core i5-4670	3.4GHz (3.8GHz)	Four	★★★★☆	\$275	100
Core i5-4670K	3.4GHz (3.8GHz)	Four	★★★★☆	\$339	100
Core i7-4770	3.4GHz (3.9GHz)	Four plus four logical (Hyper-Threading)	★★★★☆	\$369	125
Core i7-4770K	3.5GHz (3.9GHz)	Four plus four logical (Hyper-Threading)	★★★★☆	\$409	125
Core i7-4771	3.5GHz (3.9GHz)	Four plus four logical (Hyper-Threading)	★★★★☆	\$399	125

each physical core present. For example, a quad-core processor appears to Windows as an eight-core CPU. These virtual cores help make the CPU more efficient and can speed up tasks that can use multiple cores at once.

In the Haswell range the Pentium chips are dual-core, the Core i3 models are dual-core with Hyper-Threading, the Core i5 CPUs are quad-core and the Core i7 chips are quad-core with Hyper-Threading.

Core i5 and Core i7 chips also have Turbo Boost technology. This lets them overclock themselves automatically when there's enough thermal headroom (a good reason to fit a decent cooler), improving performance.

Processors with a 'K' in the model name are unlocked, so you can manually adjust the multiplier to speed up the CPU. This is the only safe way to overclock: adjusting the external bus speed also affects the graphics and RAM.

ONBOARD GRAPHICS

Intel boosted the quality of its onboard graphics for Haswell, although the company still lags behind AMD in this regard. Most of the chips in the range use the Intel HD Graphics 4600 GPU, which is good enough to play some older games at a resolution of 1,280x720 (see graph below left for the results of our comparative testing).

The Intel HD Graphics 4400 is only a little slower, but anything below this isn't going to be good enough to play games. All graphics chips can cope with decoding HD video, and they all support the HDMI 1.4a standard.

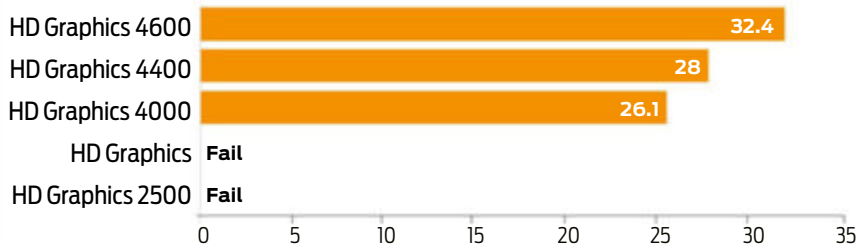
VERDICT

Haswell chips are extremely quick, making them the best choice for a high-performance computer. We think the Core i7 range is a little expensive and doesn't give enough of a performance boost over the i5 range overall.

For the best performance, buy the Core i5-4670K, which you can overclock easily to get more speed out of it. If you're not worried about overclocking, the Core i5-4590 is a great choice, as it's only a little slower, but is a lot cheaper. Both win Best Value awards.

If you're looking to build a low-cost PC, the Pentium G3220 strikes a balance between cost and performance. For more performance, the Core i3-4160 can cope with anything you throw at it and is a great choice for a budget computer. Both win Recommended awards.

DIRT SHOWDOWN 1,280X720, HIGH DETAIL, 4X AA



Intel Devil's Canyon

One of the issues with Intel's Haswell processors was that they weren't that much faster than the previous generation. However, the company has looked to fix that with its Devil's Canyon line of CPUs.

ARCHITECTURE

Although the internal architecture of Devil's Canyon CPUs remains the same as it is for Haswell chips, Intel has used a new thermal interface material. This reduces the heat of the CPU, increasing how far the clock speed can be pushed. This is particularly important for the 'K' variety of the chips: when we tested the Core i7-4790K, we managed to push it to 4.7GHz using the stock Intel cooler.

Turbo Boost technology lets the processor overclock itself when there's enough thermal headroom; with Devil's Canyon, the

DEVIL'S CANYON

MODEL	FREQUENCY (TURBO)	CORES	RATING	PRICE	BENCHMARK SCORE
Core i5-4690	3.5GHz (3.9GHz)	Four	★★★★★	\$299	103
Core i5-4690K	3.5GHz (3.9GHz)	Four	★★★★★	\$324	103
Core i7-4790	3.6GHz (4GHz)	Four plus four logical (Hyper-Threading)	★★★★★	\$415	129
Core i7-4790K	4GHz (4.4GHz)	Four plus four logical (Hyper-Threading)	★★★★★	\$469	143

chips can boost higher for longer.

Devil's Canyon processors require a motherboard with an Intel Z97 or H97 chipset, although the chips will work on some 8-series motherboards provided those boards have a BIOS update – check your motherboard manufacturer's website for more details.

ONBOARD GRAPHICS

Devil's Canyon doesn't change the onboard graphics, with all of the chips using Intel HD Graphics 4600 chips. This is fast enough for some light gaming and decoding video, but you'll want to upgrade to a dedicated graphics card for proper a gaming system.

VERDICT

There are only four models of Devil's Canyon processors available at the moment, with the Core i7 range being incredibly fast, but also extremely expensive. We feel as though the Core i5-4690K hits the sweet spot between performance and price; it wins a Best Value award.



Intel Haswell-E

Intel's Haswell-E chips are the company's high-end, high-power CPUs for people that want absolutely the best performance. It should come as no surprise that they're also the most expensive desktop chips that Intel manufactures. Haswell-E chips use the LGA2011-3 socket, which means you'll have to buy a new X99 motherboard to use them.

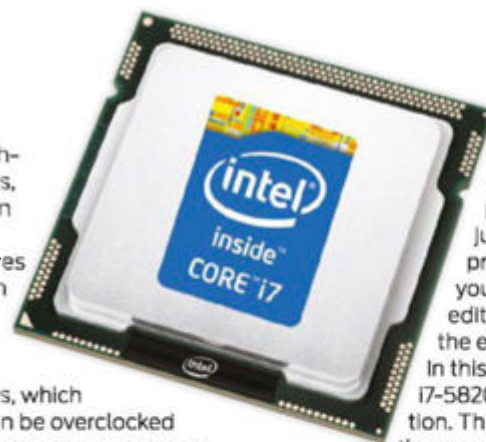
ARCHITECTURE

Haswell-E chips use the same Haswell architecture internally, although there are some changes. For starters, these chips all use Hyper-Threading and they have six or eight cores, making them well suited to complicated multithreaded applications. Intel has also boosted Level 3 cache to 15MB or 20MB, again reducing the amount of time the chips have to access slow system RAM.

While all other Intel chips use DDR3 RAM, Haswell-E chips use the newer DDR4 RAM instead. This is technically quicker than DDR3, although we've always found that RAM speed makes little difference to system speed.

As with other high-end Intel processors, Haswell-E chips can use Turbo Boost to overclock themselves automatically when there's enough thermal headroom. All the chips have unlocked multipliers, which means that they can be overclocked easily if you want to squeeze even more performance out of them. Needless to say, these chips scored the highest scores in our benchmarks that we've ever seen.

You don't get onboard graphics with the Haswell-E processors, and will have to install a dedicated graphics card instead or the system simply won't even boot up.



VERDICT

At these kinds of prices it's hard to justify any of these processors, unless you do a lot of video editing and really need the extra performance. In this case, the Core i7-5820K is the best option. This six-core chip has the same performance as the Core i7-5930K, but it's

cheaper as it supports fewer PCI-E lanes, which means multi-graphics card setups may run a little slower, and newer Z and H 97 motherboards with M.2 SSD support may also be affected. Most people won't notice that, making this super-fast CPU a Best Value winner.

HASWELL-E

MODEL	FREQUENCY (TURBO)	CORES	RATING	PRICE	BENCHMARK SCORE
Core i7-5820K	3.3GHz (3.6GHz)	Six plus six logical (Hyper-Threading)	★★★★★	\$535	179
Core i7-5930K	3.5GHz (3.7GHz)	Six plus six logical (Hyper-Threading)	★★★★★	\$789	179
Core i7-5960X	3GHz (3.5GHz)	Eight plus eight logical (Hyper-Threading)	★★★★★	\$1419	230

AMD Socket AM1

The AM1 range contains AMD's super-budget processors, designed for low-cost computers that are capable of simple tasks. Prices really are low: even the top-end Athlon 5350 costs just \$80. All the chips draw incredibly low amounts of power, and are rated at just 25W TDP. That's a fraction of the power required by the high-end AM3+ chip.

AMD has abandoned its usual cooler mount, creating a new one for AM1. The tiny chips don't need as much cooling, and the new design means it's possible to make smaller motherboards for smaller computers.

We're not overly impressed with the new cooler's design, though. It uses just two clips diagonally opposite each other; they don't make the cooler feel as secure as Intel coolers do, which use four clips. The instructions don't help, either: don't try to push the entire assembly through the holes in the board; instead, push the clips in first and then the retaining pins second. Fortunately, once in place the stock cooler is small and unobtrusive and quiet.

AM1					
MODEL	FREQUENCY	CORES	RATING	PRICE	BENCHMARK SCORE
Sempron 2650	1.45GHz	Two	★★★★★	\$42	8
Sempron 3850	1.3GHz	Four	★★★★★	\$53	10
Athlon 5150	1.6GHz	Four	★★★★★	\$54	14
Athlon 5350	2.05GHz	Four	★★★★★	\$80	17

ARCHITECTURE

There are currently only four processors that use the AM1 socket. All four chips are part of AMD's Kabini family using its Jaguar 28nm microarchitecture, and all but the cheapest Sempron 2650 have four cores: the low-end 2560 is the current dual-core exception. It's common, with modern processors, for each core to have its own L1 and L2 cache, helping speed up performance by reducing how often a CPU has to access slow system RAM. Shared L3 cache sits on top of this, for when different cores have to access the same data. With the AM1 chips, there's no L3 cache and the L2 cache is shared.

The AM1 chips also use comparatively low clock speeds: the fastest model, the Athlon 5350, has a clock speed of just 2.05GHz. This has a knock-on effect on performance, and the AM1 range is the slowest we've ever tested, particularly in our multitasking benchmarks. The chips will cope well with everyday simple tasks, but you wouldn't want to push too hard.

ONBOARD GRAPHICS

AMD has integrated Radeon R3 graphics on to the chips, which has 128 graphics cores. The Athlon processors' graphics are clocked at 600MHz while the Sempron 3850 runs at 450MHz and the Sempron 2650 at 400MHz.

You'll need to keep your expectations in check. Both Sempron processors failed even to load Dirt Showdown, while the Athlon chips were too slow to play it at our usual 1,280x720 resolution with 4x AA and High quality graphics settings. The chips were also a bottleneck with our discrete graphics card. The integrated graphics on all chips are good enough for Full HD video.

VERDICT

It's hard to recommend any of the processors here. They may be cheap, but they're very slow and feel like a false economy to us. Unless you want to build a very low-powered and quiet computer, the FM2 range is a much better choice and not a lot more expensive.

AMD Socket AM3+

While most of AMD's range has built-in graphics chips, the AM3+ range doesn't have this capability. Given that you can pick up an AMD HD 5450 graphics card for around \$40, adding graphics to the system doesn't have to be expensive.

ARCHITECTURE

AMD's FX-series use one or more modules, each of which has two cores and 2MB of L2 cache. All the FX-chips here have 8MB of L3 cache save for the FX-4300, which has 4MB. The modular approach is intended to share cache more efficiently, providing a larger pool of L2 cache for each core.

The thermal design power (TDP) varies from 95W to a staggering 220W with the latest FX-9000 series, making them potentially very power-hungry. In contrast AMD's FM2+ processors currently top out at 95W TDP.

One of the appeals of AMD's FX-series is that they all have unlocked multipliers, so a quick performance upgrade is potentially just a visit to the BIOS away. By changing the multiplier settings you can boost your performance beyond the stock speed of your processor. This is, however, not

without risk so we would recommend boosting the speed in small increments to ensure stability.

The FX-series is also notable because it goes all the way up to eight cores. Nowadays, Windows applications are better positioned to take advantage of more than four cores. Even the cheapest FX-4300 managed an overall score of 60 in our benchmarks, with the eight-core processors achieving the highest scores.

AMD FX chips use Turbo Core technology, which is similar to Intel's Turbo Boost and automatically increases the clock speed

when there's enough thermal overhead. Models that have an 'E' in the name are 'low-power' models, although they still have a TDP rating of 95W.

VERDICT

If you're prepared to add a graphics card, the AM3+ range gives great performance for the money. Unsurprisingly the FX-9370 and FX-9590 provided the best performance. We feel as though the eight-core FX-9370 gives you the best balance between performance and price. Further down the scale, the FX-8350 is only a little slower, but this eight-core model is still quick and excellent value. The six-core FX-6300 wins a Recommended award.

AM3+					
MODEL	FREQUENCY (TURBO)	CORES	RATING	PRICE	BENCHMARK SCORE
FX-4300	3.8GHz (4GHz)	Four	★★★★★	\$139	60
FX-4350	4.2GHz (4.3GHz)	Four	★★★★★	\$145	63
FX-6300	3.5GHz (4.1GHz)	Six	★★★★★	\$149	73
FX-6350	3.9GHz (4.2GHz)	Six	★★★★★	\$176	75
FX-8320	3.5GHz (4GHz)	Eight	★★★★★	\$199	85
FX-8320E	3.2GHz (4GHz)	Eight	★★★★★	\$221	83
FX-8350	4GHz (4.2GHz)	Eight	★★★★★	\$249	98
FX-8370E	3.3GHz (4.3GHz)	Eight	★★★★★	\$285	64
FX-9370	4.4GHz (4.7GHz)	Eight	★★★★★	\$289	109
FX-9590	4.7GHz (5GHz)	Eight	★★★★★	\$409	117

AMD Socket FM2/FM2+

AMD's A-series processors are designed to offer brilliant all-round performance, with a high-quality CPU and GPU bundled together in one package. These processors consist of the FM2 and FM2+ processor models. They're not as quick as the FX range in 2D tasks, but with high-quality graphics, they're brilliant all-rounders if you don't want to buy a dedicated graphics card. These chips are also extremely well priced, letting you build a powerful system on a tight budget.

ARCHITECTURE

The latest generation processors, codenamed Kaveri, use AMD's Steamroller modules for the CPU and GCN 1.0 (Graphics Core Next) units for the GPU. Kaveri processors will only work with an FM2+ motherboard.

Kaveri was pre-dated by the Richland and Trinity generation of processors, and both of these will work with FM2 or FM2+ motherboards due to the backwards-compatible nature of FM2+ motherboards.

FM2+							
MODEL	FREQUENCY (TURBO)	CORES	GRAPHICS SPEED	GRAPHICS CORES	RATING	PRICE	BENCHMARK SCORE
A6-7400K	3.5GHz (3.9GHz)	Two	756MHz	256	★★★★★	\$85	27
A8-7600	3.1GHz (3.8GHz)	Four	720MHz	384	★★★★★	\$132	50
A10-7700K	3.4GHz (3.8GHz)	Four	720MHz	384	★★★★★	\$179	54
A10-7800	3.5GHz (3.9GHz)	Four	720MHz	512	★★★★☆	\$198	54
A10-7850K	3.7GHz (4GHz)	Four	720MHz	512	★★★★☆	\$209	57

FM2							
MODEL	FREQUENCY (TURBO)	CORES	GRAPHICS SPEED	GRAPHICS CORES	RATING	PRICE	BENCHMARK SCORE
A4-4000	3GHz (3.2GHz)	Two	720MHz	128	★★★★☆	\$39	16
A4-7300	3.8GHz (4GHz)	Two	800MHz	128	★★★★☆	\$58	19
A6-6400K	3.9GHz (4.1GHz)	Two	800MHz	192	★★★★★	\$68	24
A6-6420K	4GHz (4.2GHz)	Two	800MHz	192	★★★★☆	\$89	24
A8-5600K	3.6GHz (3.9GHz)	Four	760MHz	256	★★★★★	\$109	43
A10-6700	3.7GHz (4.3GHz)	Four	844MHz	384	★★★★☆	\$150	48
A10-6790K	4GHz (4.3GHz)	Four	844MHz	384	★★★★★	\$155	54
A10-6800K	4.1GHz (4.4GHz)	Four	844MHz	384	★★★★☆	\$165	54

Both of these generations use the older Piledriver modules.

AMD has managed to shrink its manufacturing process for the latest generation of Kaveri processors to 28nm, down from 32nm in previous generations. This has helped keep the thermal design power (TDP) rating to just 95W even on the quickest processors, meaning that they use less power and run cooler.

You can't tell from the model name how many cores a processor has, so you'll need to check our table for the full details. AMD's FM2 and FM2+ chips are all either dual- or

quad-core models, though. Pairs of cores are organised within the CPU as modules, sharing Level 2 cache to speed up access to slow system memory.

As well as the standard clock speed, all these chips use AMD's Turbo Core technology to increase the clock speed automatically when there's enough thermal overhead. This helps boost performance. Finally, look out for the models with a 'K' suffix, as these have unlocked multipliers, so that you can easily overclock them.

ONBOARD GRAPHICS

A-series processors include AMD's integrated graphics. On these chips, the integrated graphics are often fast enough to play modern games without the need for a discrete graphics card. The quality of the graphics chip depends on the processor.

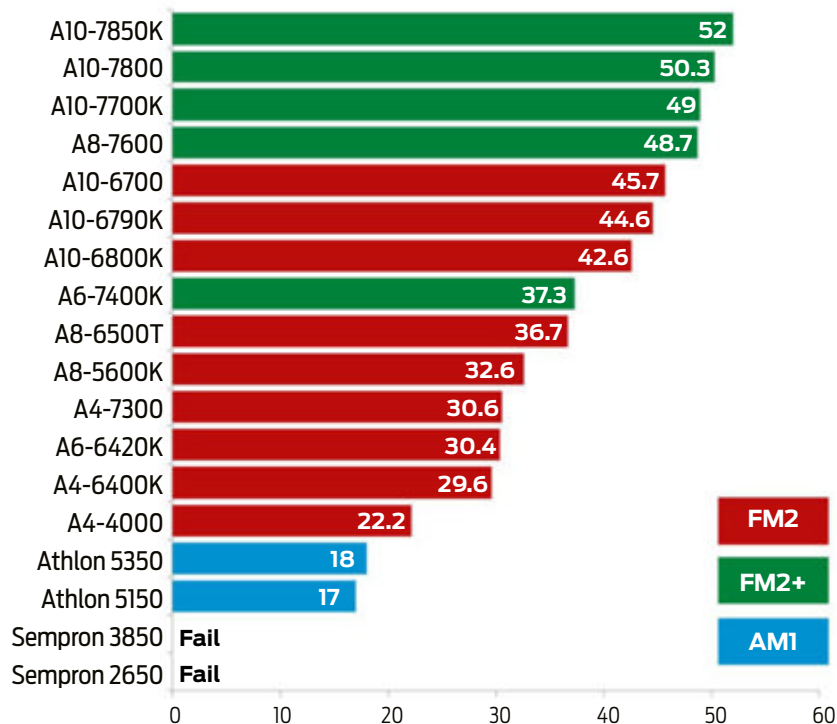
With FX-series chips, AMD's naming convention tells you how many cores a chip has; with FM2 and FM2+ models, there's no such luxury and the model name refers to how many graphics cores there are. For example, the A4 range has 128 cores. Within each model range the graphics core can run at different speeds, so it's important to check the specifications before you buy.

VERDICT

The older FM2 range isn't that quick and is outclassed by the newer FM2+ processors; however, if you have an FM2 motherboard, the A6-6400K strikes a very attractive balance between cost and performance. It wins a Best Value award.

If you want a bit more performance, the FM2+ A6-7400K is a great choice and wins a Best Buy award. For a great balance between desktop and graphics performance, the A10-7700K processor is a brilliant all-rounder, and also wins a Best Value award.

DIRT SHOWDOWN 1,280X720, HIGH DETAIL, 4X AA



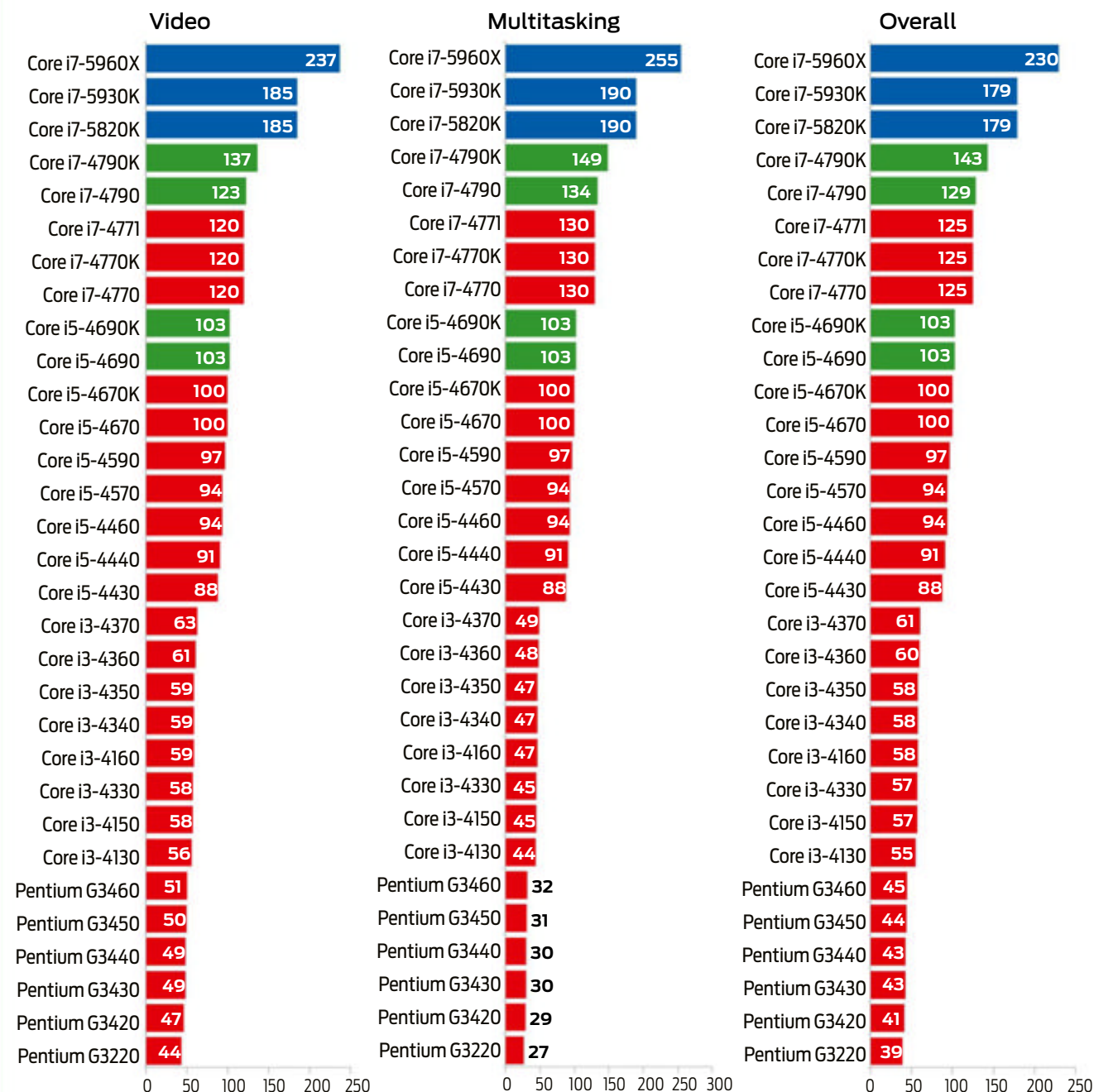
Intel benchmarks

Haswell-E

Haswell

Devil's Canyon

2D Performance



Intel Award winners



THE AMAZING

LINDY

LINDY
CONNECTION PERFECTION

WHATEVER THE PROBLEM, SHE'S HERE FOR YOU AND SHE ALWAYS DELIVERS!



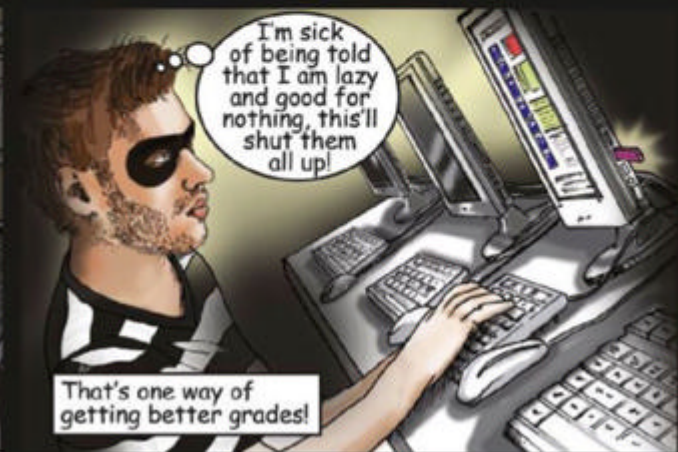
It's late at night and we find the villain up to no good in the computer suite of his college!

With this I can take the software and student's course work from these computers that I need, then just wipe the hard drive and no one will know it was me!



I'm sick of being told that I am lazy and good for nothing, this'll shut them all up!

That's one way of getting better grades!



The next day as planned the result is complete chaos and panic!!

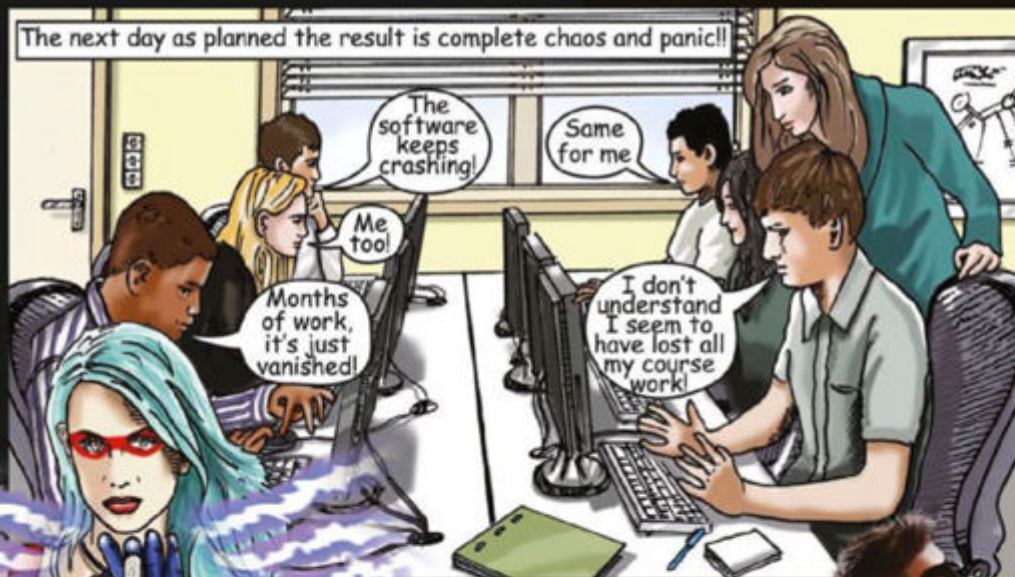
The software keeps crashing!

Same for me

Me too!

Months of work, it's just vanished!

I don't understand I seem to have lost all my course work!



Now I can return all those files



THE LESSON TODAY IS NOT ALL DATA THEFT IS CARRIED OUT ONLINE!!

A HAPPY ENDING... WELL FOR SOME OF US!

LINDY USB PORT BLOCKERS

LINDY can prevent this happening again!

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CABLES, CONNECTORS, HEADPHONES AND MORE...MUCH MORE!

AMD benchmarks

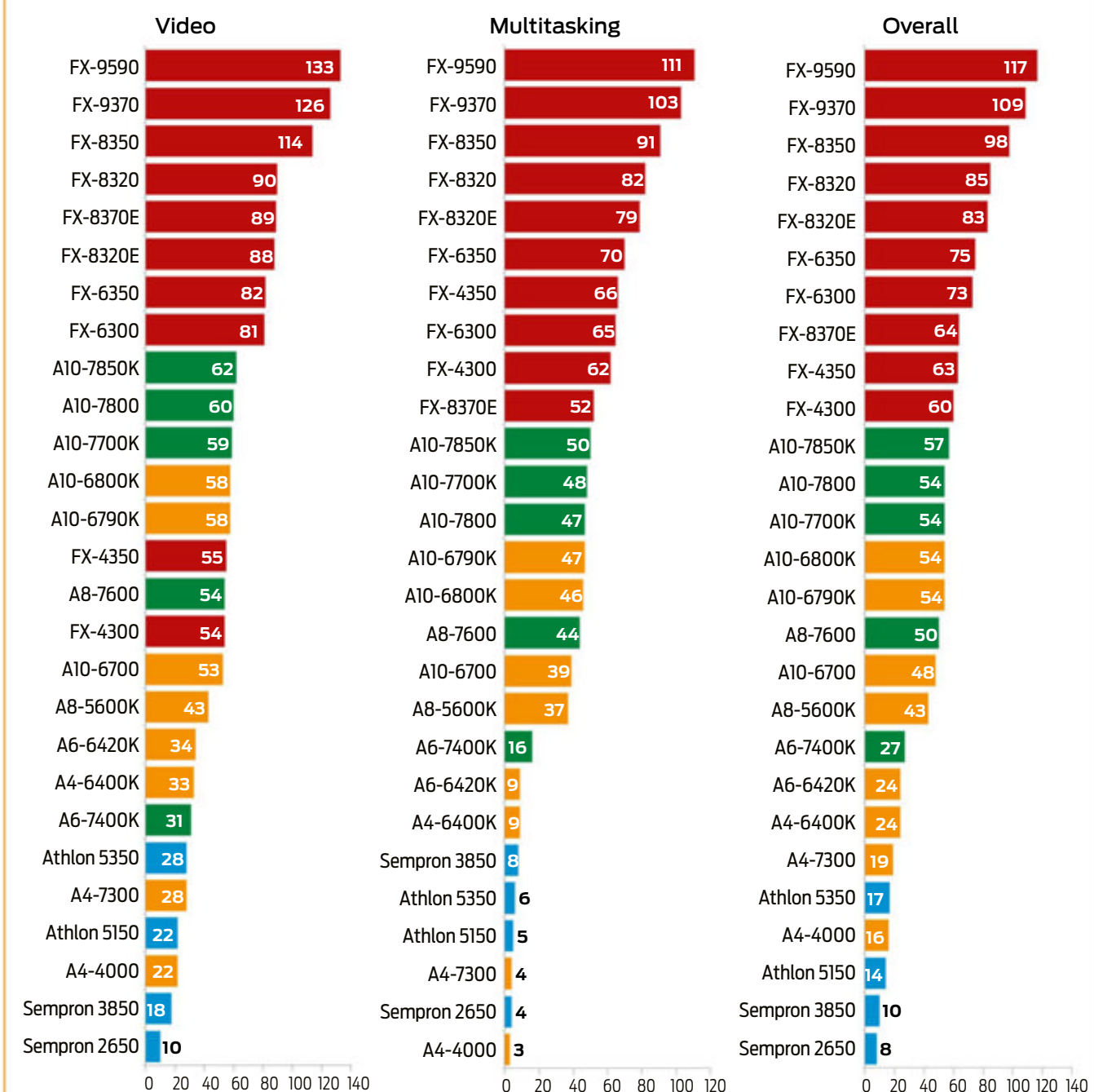
AM3+

FM2+

FM2

AM1

2D Performance



AMD Award winners



HASWELL

	RECOMMENDED								RECOMMENDED	
	INTEL	INTEL	INTEL	INTEL	INTEL	INTEL	INTEL	INTEL	INTEL	INTEL
	Pentium G3220	Pentium G3420	Pentium G3430	Pentium G3440	Pentium G3450	Pentium G3460	Core i3-4130	Core i3-4150	Core i3-4160	Core i3-4330
Rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Socket	LGA1150	LGA1150	LGA1150	LGA1150	LGA1150	LGA1150	LGA1150	LGA1150	LGA1150	LGA1150
Cores	Two	Two	Two	Two	Two	Two	Two plus two logical (Hyper-Threading)	Two plus two logical (Hyper-Threading)	Two plus two logical (Hyper-Threading)	Two plus two logical (Hyper-Threading)
Frequency	3GHz	3.2GHz	3.3GHz	3.3GHz	3.4GHz	3.5GHz	3.4GHz	3.5GHz	3.6GHz	3.5GHz
Multiplier	x30	x32	x33	x33	x34	x35	x34	x35	x36	x35
External bus	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz
Process	22nm	22nm	22nm	22nm	22nm	22nm	22nm	22nm	22nm	22nm
Level 1 cache	2x 64KB	2x 64KB	2x 64KB	2x 64KB	2x 64KB	2x 64KB	2x 64KB	2x 64KB	2x 64KB	2x 64KB
Level 2 cache	2x 256KB	2x 256KB	2x 256KB	2x 256KB	2x 256KB	2x 256KB	2x 256KB	2x 256KB	2x 256KB	2x 256KB
Level 3 cache	3MB	3MB	3MB	3MB	3MB	3MB	3MB	3MB	3MB	3MB
Supported memory type	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3
Power rating (TDP)	53W	53W	53W	53W	53W	53W	54W	54W	54W	54W
Integrated graphics	HD Graphics	HD Graphics	HD Graphics	HD Graphics	HD Graphics	HD Graphics	HD Graphics 4400	HD Graphics 4400	HD Graphics 4400	HD Graphics 4600
Price	\$79	\$83	\$121	\$109	\$98	\$135	\$152	\$159	\$155	\$170

									BEST VALUE	BEST VALUE	
	INTEL	INTEL	INTEL	INTEL	INTEL	INTEL	INTEL	INTEL	INTEL	INTEL	INTEL
	Core i3-4340	Core i3-4350	Core i3-4360	Core i3-4370	Core i5-4430	Core i5-4440	Core i5-4460	Core i5-4570	Core i5-4590	Core i5-4670	Core i5-4670K
Rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Socket	LGA1150	LGA1150	LGA1150	LGA1150	LGA1150	LGA1150	LGA1150	LGA1150	LGA1150	LGA1150	LGA1150
Cores	Two plus two logical (Hyper-Threading)	Two plus two logical (Hyper-Threading)	Two plus two logical (Hyper-Threading)	Two plus two logical (Hyper-Threading)	Four	Four	Four	Four	Four	Four	Four
Frequency (Turbo)	3.6GHz	3.6GHz	3.7GHz	3.8GHz	3GHz (3.2GHz)	3.1GHz (3.3GHz)	3.2GHz (3.4GHz)	3.2GHz (3.6GHz)	3.3GHz (3.7GHz)	3.4GHz (3.8GHz)	3.4GHz (3.8GHz)
Multiplier	x36	x36	x37	x38	x30	x31	x32	x32	x33	x34	x34
External bus	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz
Process	22nm	22nm	22nm	22nm	22nm	22nm	22nm	22nm	22nm	22nm	22nm
Level 1 cache	2x 64KB	2x 64KB	2x 64KB	2x 64KB	4x 64KB	4x 64KB	4x 64KB	4x 64KB	4x 64KB	4x 64KB	4x 64KB
Level 2 cache	2x 256KB	2x 256KB	2x 256KB	2x 256KB	4x 256KB	4x 256KB	4x 256KB	4x 256KB	4x 256KB	4x 256KB	4x 256KB
Level 3 cache	3MB	3MB	3MB	3MB	6MB	6MB	6MB	6MB	6MB	6MB	6MB
Supported memory type	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3
Power rating (TDP)	54W	54W	54W	54W	84W	84W	84W	84W	84W	84W	84W
Integrated graphics	HD Graphics 4600	HD Graphics 4600	HD Graphics 4600	HD Graphics 4600	HD Graphics 4600	HD Graphics 4600	HD Graphics 4600	HD Graphics 4600	HD Graphics 4600	HD Graphics 4600	HD Graphics 4600
Price	\$218	\$159	\$169	\$180	\$200	\$212	\$255	\$249	\$269	\$275	\$339

	DEVIL'S CANYON								HASWELL-E		
	INTEL	INTEL	INTEL	INTEL	BEST VALUE	INTEL	INTEL	BEST VALUE	INTEL	INTEL	INTEL
	Core i7-4770	Core i7-4770K	Core i7-4771	Core i5-4690	Core i5-4690K	Core i7-4790	Core i7-4790K	Core i7-5820K	Core i7-5930K	Core i7-5960X	
Rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	
Socket	LGA1150	LGA1150	LGA1150	LGA1150	LGA1150	LGA1150	LGA1150	LGA2011-v3	LGA2011-v3	LGA2011-v3	
Cores	Four plus four logical (Hyper-Threading)	Four plus four logical (Hyper-Threading)	Four plus four logical (Hyper-Threading)	Four	Four	Four plus four logical (Hyper-Threading)	Four plus four logical (Hyper-Threading)	Six plus six logical (Hyper-Threading)	Six plus six logical (Hyper-Threading)	Eight plus eight logical (Hyper-Threading)	
Frequency (Turbo)	3.4GHz (3.9GHz)	3.5GHz (3.9GHz)	3.5GHz (3.9GHz)	3.5GHz (3.9GHz)	3.5GHz (3.9GHz)	3.6GHz (4GHz)	4GHz (4.4GHz)	3.3GHz (3.6GHz)	3.5GHz (3.7GHz)	3GHz (3.5GHz)	
Multiplier	x34	x35	x35	x35	x35	x36	x40	x33	x35	x30	
External bus	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	
Process	22nm	22nm	22nm	22nm	22nm	22nm	22nm	22nm	22nm	22nm	
Level 1 cache	4x 64KB	4x 64KB	4x 64KB	4x 64KB	4x 64KB	4x 64KB	4x 64KB	6x 64KB	6x 64KB	8x 64KB	
Level 2 cache	4x 256KB	4x 256KB	4x 256KB	4x 256KB	4x 256KB	4x 256KB	4x 256KB	6x 256KB	6x 256KB	8x 256KB	
Level 3 cache	8MB	8MB	8MB	6MB	6MB	8MB	8MB	15MB	15MB	20MB	
Supported memory type	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR4	DDR4	DDR4	
Power rating (TDP)	84W	84W	84W	84W	88W	84W	88W	140W	140W	140W	
Integrated graphics	HD Graphics 4600	HD Graphics 4600	HD Graphics 4600	HD Graphics 4600	HD Graphics 4600	HD Graphics 4600	HD Graphics 4600	None	None	None	
Price	\$369	\$409	\$399	\$299	\$324	\$415	\$469	\$535	\$789	\$1419	

	AMD AM1				AMD AM3+				
	AMD	AMD	AMD	AMD	AMD	AMD	RECOMMENDED	AMD	AMD
	Sempron 2650	Sempron 3850	Athlon 5150	Athlon 5350	FX-4300	FX-4350	FX-6300	FX-6350	FX-8320
Rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★★	★★★★☆	★★★★☆
Socket	AM1	AM1	AM1	AM1	AM3+	AM3+	AM3+	AM3+	AM3+
Cores	Two	Four	Four	Four	Four	Four	Six	Six	Eight
Frequency (Turbo)	1.45GHz	1.3GHz	1.6GHz	2.05GHz	3.8GHz (4GHz)	4.2GHz (4.3GHz)	3.5GHz (4.1GHz)	3.9GHz (4.2GHz)	3.5GHz (4GHz)
Multiplier	x14.5	x13	x16	x20.5	x19	x21	17.5x	x19.5	x17.5
External bus	100MHz	100MHz	100MHz	100MHz	200MHz	200MHz	200MHz	200MHz	200MHz
Process	28nm	28nm	28nm	28nm	32nm	32nm	32nm	32nm	32nm
Level 1 cache	4x 32KB	4x 32KB	4x 32KB	4x 32KB	2x 64KB	2x 64KB	3x 64KB	3x 64KB	4x 64KB
Level 2 cache	1MB	2MB	2MB	2MB	2x 2MB	2x 2MB	3x 2MB	3x 2MB	4x 2MB
Level 3 cache	None	None	None	None	4MB	4MB	8MB	8MB	8MB
Supported memory type	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3
Power rating (TDP)	25W	25W	25W	25W	95W	125W	95W	125W	125W
Integrated graphics	AMD Radeon R3	AMD Radeon R3	AMD Radeon R3	AMD Radeon R3	None	None	None	None	None
Price	\$42	\$53	\$54	\$80	\$139	\$145	\$149	\$176	\$199

	BEST VALUE				AMD FM2+				
	AMD	AMD	AMD	AMD	AMD	AMD	AMD	AMD	AMD
	FX-8320E	FX-8350	FX-8370E	FX-9370	FX-9590	A6-7400K	A8-7600	A10-7700K	A10-7800
Rating	★★★★☆	★★★★★	★★★★☆	★★★★★	★★★★☆	★★★★★	★★★★☆	★★★★★	★★★★☆
Socket	AM3+	AM3+	AM3+	AM3+	AM3+	FM2+	FM2+	FM2+	FM2+
Cores	Eight	Eight	Eight	Eight	Eight	Two	Four	Four	Four
Frequency (Turbo)	3.2GHz (4GHz)	4GHz (4.2GHz)	3.3GHz (4.3GHz)	4.4GHz (4.7GHz)	4.7GHz (5GHz)	3.5GHz (3.9GHz)	3.1GHz (3.8GHz)	3.4GHz (3.8GHz)	3.5GHz (3.9GHz)
Multiplier	x16	x20	x16.5	x22	x23.5	x35	x31	x34	x35
External bus	200MHz	200MHz	200MHz	200MHz	200MHz	100MHz	100MHz	100MHz	100MHz
Process	32nm	32nm	32nm	32nm	32nm	28nm	28nm	28nm	28nm
Level 1 cache	4x 64KB	4x 64KB	4x 64KB	4x 64KB	4x 64KB	128KB	256KB	256KB	256KB
Level 2 cache	4x 2MB	4x 2MB	4x 2MB	4x 2MB	4x 2MB	2x 512KB	2x 2MB	2x 2MB	2x 2MB
Level 3 cache	8MB	8MB	8MB	8MB	8MB	None	None	None	None
Supported memory type	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3
Power rating (TDP)	95W	125W	95W	220W	220W	65W	65W	95W	65W
Integrated graphics	None	None	None	None	None	AMD Radeon R5	AMD Radeon R7	AMD Radeon R7	AMD Radeon R7
Price	\$221	\$249	\$285	\$289	\$409	\$85	\$132	\$179	\$198

	AMD FM2								
	AMD	AMD	AMD	BEST VALUE	AMD	AMD	AMD	AMD	AMD
	A10-7850K	A4-4000	A4-7300	A6-6400K	A6-6420K	A8-5600K	A10-6700	A10-6790K	A10-6800K
Rating	★★★★☆	★★★★☆	★★★★☆	★★★★★	★★★★☆	★★★★★	★★★★☆	★★★★★	★★★★☆
Socket	FM2+	FM2	FM2	FM2	FM2	FM2	FM2	FM2	FM2
Cores	Four	Two	Two	Two	Two	Four	Four	Four	Four
Frequency (Turbo)	3.7GHz (4GHz)	3GHz (3.2GHz)	3.8GHz (4GHz)	3.9GHz (4.1GHz)	4GHz (4.2GHz)	3.6GHz (3.9GHz)	3.7GHz (4.3GHz)	4GHz (4.3GHz)	4.1GHz (4.4GHz)
Multiplier	x37	x30	x38	x39	x40	x36	x37	x40	x41
External bus	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz
Process	28nm	32nm	28nm	32nm	32nm	32nm	32nm	32nm	32nm
Level 1 cache	256KB	64KB	64KB	64KB	64KB	2x 64KB	2x 64KB	2x 64KB	2x 64KB
Level 2 cache	2x 2MB	1MB	1MB	1MB	1MB	2x 2MB	2x 2MB	2x 2MB	2x 2MB
Level 3 cache	None	None	None	None	None	None	None	None	None
Supported memory type	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3
Power rating (TDP)	95W	65W	65W	65W	65W	100W	65W	100W	100W
Integrated graphics	AMD Radeon R7	AMD Radeon HD 7480D	AMD Radeon HD 8470D	AMD Radeon HD 8470D	AMD Radeon HD 8470D	AMD Radeon HD 7560D	AMD Radeon HD 8670D	AMD Radeon HD 8670D	AMD Radeon HD 8670D
Price	\$209	\$39	\$58	\$68	\$89	\$109	\$150	\$155	\$165

Welcome to **Upgrade Australia**

ESSENTIAL GAMING DESKTOP UPGRADES

A spotlight on storage and CPU considerations when upgrading your desktop to get the most out of your gaming PC.

Whenver a new suite of motherboards is released with the latest speed improvements in the industry, it's well worth considering a desktop upgrade. Older motherboards lack the latest features such as expanded DDR4 RAM and SATA 3 for maximum SSD performance, particularly when coupled with Dual M.2 technology. The motherboard may be the foundation of a gaming PC, but you'll need a reliable SSD and high-performance CPU to avoid bottlenecking your desktop's potential.



FAST AND RELIABLE STORAGE

Loading games, your operating system and everything in between is faster with an SSD. An Intel 730 SSD is a great choice for primary storage with enduring 20nm NAND technology and factory-overclocked components for faster processing and dependable computing. The 240GB model features 550MB/s sequential read and 270MB/s sequential write speeds, and is rated for 50GB writes per day. The 480GB model sports the same sequential read speed, but pushes the sequential write speed to 470MB/s, rated at 70GB writes per day. With a two-drive RAID 0 configuration, you're looking at 1020MB/s and 530MB/s read/write for the 240GB, with 1073MB/s and 960MB/s read/write for the 480GB model.

In gaming terms, both installation and loading times are vastly improved compared with traditional HDD storage. For certain titles such as Battlefield Hardline, this affords a competitive edge as loading maps faster than your teammates offers more time to refine your loadout and have the first choice of vehicle before a round begins.

AFFORDABLE POWER

If you're upgrading on a budget, but still want a CPU that can keep up with the latest games, the 4th generation Intel Core i5-4690K is a reliable choice. The i5-4690K has four cores and 6MB cache with a 3.5GHz base frequency. Intel Turbo Boost Technology 2.0 automatically boosts CPU performance during intensive gaming sessions, pushing the base frequency up to 4.0GHz. If you need more speed, the i5-4690K is fully unlocked for overclocking, which allows for higher base speeds for CPU tweekers looking to get even greater gaming performance.

GREATER PROCESSING POWER

More and more games are reliant on CPU for high-end performance, which is where it's worth considering a jump from Core i5 to an Intel Core i7-4790K quad-core chip. Shooters such as Evolve and Battlefield Hardline benefit from a faster CPU, while simulators like Arma 3 and Project CARS take advantage of a high-performance CPU. The Core i7-4790K is a four-thread, eight-core CPU (via Intel Hyper-Threading Technology) has 8MB cache and ships with a base 4.0GHz speed. There's also an automatic 4.4GHz boost option by way of Intel Turbo Boost Technology 2.0. It's fully unlocked for overclocking, so you can push the base speed even further to enhance frame rate for smoother gaming experiences.



THE ULTIMATE CPU

If you're going all out on your next gaming desktop upgrade, the Intel Core i7-5960X is what you want. It boasts eight cores and sixteen threads, with 20MB cache and a base frequency of 3.0GHz as well as support for DDR4 memory. Intel Turbo Boost Technology 2.0 intuitively pushes the base frequency up to 3.5GHz, ensuring your CPU will never be the bottleneck during resource-intensive, high-end gaming. As would be expected, the i7-5960X is also unlocked and ready for overclocking, meaning it's future-proofed for distant games that require more CPU power. The Core i7-5960X CPU improves loading times, frame rates and makes it possible to seamlessly live-stream high-end PC games.



Life Is Strange

EPISODIC GRAPHIC ADVENTURES ARE ALL THE RAGE

In the latest game from French developer Dontnod, life is strange, but that strangeness is also what makes life wonderful. Part human drama about an insecure, shy outcast trying to find her feet both at school and in her social life, and part low-fi sci-fi examining the effects of knowing how the future will unfold can influence your decision making process in the present, Life Is Strange Episode 1: Chrysalis asks far more questions than it answers but leaves you hungry for more.

Maxine "Max" Caulfield is a young, promising photography student at the prestigious Blackwell Academy in Arcadia Bay, Oregon. Obsessed with instant cameras and old-school, pre-digital photography equipment, Max is an analogue person living in a digital world. She finds it hard to fit in with her peers and lacks confidence in herself when it comes to social interactions as well as her photographic talents. She isn't outgoing enough to have more than one real friend and isn't cool or rich enough to be part of the "Vortex Club", a clique of rich, entitled students who rule the school, in many ways literally. This begins to change thanks to what initially appears

to be a prophetic dream, first seeing Max try to make her way to a lighthouse as a massive Tornado threatens Arcadia Bay, and later sees her sitting through a photographic history class. Only it's not a dream. Max can turn back the clock and use her knowledge of future events to influence her decisions in the present.

This time mechanic is core to the action of Life Is Strange. A fairly straightforward point and click style adventure game on the surface, the game shines when it requires players to work their way through situations to see the probably outcomes of their actions and then use that knowledge to solve puzzles. At one point Max needs to hide in a cupboard. Simply pulling open the cupboard door causes a domino effect that not only makes the hiding place unusable but alerts another character to her presence. Winding back time allows Max to shift objects before opening the door and changes the outcome. While some of these puzzles, especially one that sees Max trying to shift some popular girls blocking the entrance to her dorm, feel a little forced and gamey, the vast majority feel both natural and clever.

The time travel mechanic also has a huge influence on conversations and decision making. Max can rewind conversations allowing her to use conversational gambits she has learned in the future, manipulating events and people to achieve the best outcome. Or at least the best outcome she can at the time. All major decisions are recorded and will play a role in how events in subsequent episodes will play out. Having a foreshadowing of the short term effects

of any decision adds a strange level of poignancy to these major events as it changes all decisions from black and white to shades of grey. Do you intervene in a fight knowing that it will help a friend in the short term but get you into trouble or do you hang back and take a picture of the situation knowing that while your friend might have a horrible time in the short term you will have evidence that can most likely be used to help her achieve a better outcome in the future, even though it will reveal the fact that you declined to help her at the time?

Life Is Strange is slow but well-paced for the most part. Being able to rewind time at any point does remove a lot of the immediate tension from events but rather than negating that tension entirely it instead adds to a more overarching sense of trepidation as to how your actions will ultimately play out. For the most part it's also a beautifully produced game with some great looking character models and locations and a pleasantly indie/shoegaze focussed soundtrack. Although not without a few problems in pacing and puzzle design, Life Is Strange Episode 1: Chrysalis is a thoroughly enjoyable first chapter of a five part episodic adventure.

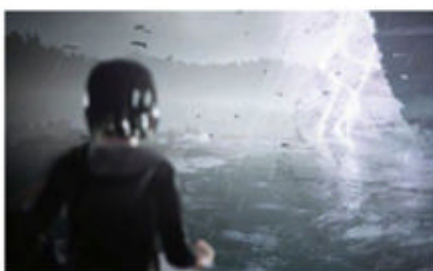
Daniel Wilks

KEY SPECS

www.lifeisstrange.com

Genre - Adventure • Developer - Dontnod Entertainment • Publisher - Square Enix • Platform - PC, Xbox One, Xbox 360, PS4, PS3

OVERALL



Apotheon

OLD SCHOOL GAMING, REALLY OLD SCHOOL ART

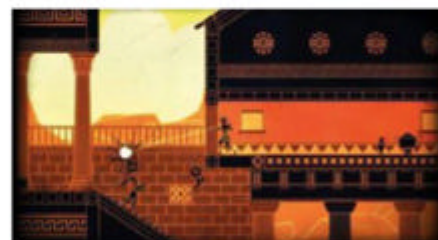
In 1989 a dedicated designer set a new benchmark for side scrolling platform games. Prince of Persia, created by a single programmer named Jordan Mechner. Using an animation technique known as rotoscoping – tracing over actual footage – Mechner brought a new level of realism to animations. Apotheon doesn't follow Prince of Persia in terms of animation, but in style and spirit it is a direct descendant. Rather than going for realistic animation, Alientrap has instead opted for a much more stylistic approach, making the game look as though it is being played out on the side of a Greek vase. Solid, almost silhouetted characters that move in a manner akin to shadow puppets move and fight their way across an earthenware world, each area taking on a slightly different hue or texture, from terracotta through to a beautiful azure glaze. Hairline cracks crisscross the pottery levels. It's a stunningly beautiful approach and makes travelling to each new area a joy.

After defeating a group of raiders who have attacked his village, Nikandreos, a humble soldier, draws the eye of Hera, Queen of Olympus. The world is falling to ruins – there are fewer and fewer animals to hunt each season and the seas and reticent to give up any fish. Hera reveals that all the world's problems are the fault of her husband, Zeus and the rest

of the Hellenic pantheon. Both Hera and Nikandreos have had enough and the warrior takes up the Queen of Olympus' quest to travel to the home of the gods and punish them for their inadequacies. While the story isn't part of the Greek canon, there is a familiarity at play that brings to mind the classics of Greek mythology. Part of this comes through the measured way in which the story evolves and part from the fact that all of the characters are flawed yet capable of extraordinary acts in the manner of the Greek heroes.

The mission on Mount Olympus sees Nikandreos visiting the realms of a number of gods, having to perform certain tasks to gain their favour or vanquish them. Athena's realm sees Nikandreos having to defeat the Chimera and the Great Wolf as well as clear a temple of drunken satyrs. Each of these challenges requires a different approach. While both the Chimera and Wolf are combat challenges, they require a totally different tactical approach. The satyrs on the other hand require a stealth approach, making sure that Nikandreos is never spotted lest he be booted out of the temple. The constant switching of styles keeps the action of Apotheon fresh and rewarding for the most part, though there are some challenges, such as one in Hades that sees the player having to constantly jump and climb upwards to avoid the flames of the underworld, that don't quite work thanks to the lack of true precision in the platforming.

Though there are a few of these platforming missions the emphasis of Apotheon is definitely weighted towards combat and thankfully the system truly shines. Although simple on the surface with basic attack combos, ranged



weapons, a shield block and a defensive roll the depth of the combat engine is actually quite staggering for a 2D, side-scrolling game. Most of this depth comes down to how the controls have been implemented. The keyboard is used for directional movement and jumping while the mouse is used to attack and defend as well as the direction and angle of said abilities. Nikandreos attacks and defends in the direction and angle of the mouse pointer, ensuring that any battle isn't simply a matter of swinging away wildly. Success comes from attacking around shields or striking at the right angle to inflict the most damage or hit elusive enemies. It's extremely clever and rewards the player for taking their time. Thanks to a rather forgiving inventory, Nikandreos can carry an extraordinary number of weapons, each with different ranges, attacks and special abilities, further broadening the scope of combat. Combat rewards persistence and experimentation and the same can be said for the game as a whole. If you're willing to put in the time, Apotheon will reward you accordingly.

Daniel Wilks

KEY SPECS

www.apotheonthegame.com

Genre - Platform Action • Developer - Alientrap • Publisher - Alientrap • Platform - PC, PS4

OVERALL





Sid Meier's Starships

THE STORY CONTINUES BEYOND EARTH

There's a really interesting narrative to be had if you're willing to play three rather long games to completion, and in very specific ways. It goes a little like this: you can play Civilization V, and win by completing the spaceship wonder, and setting off on a voyage of discovery. Then you can follow up by playing Civilization: Beyond Earth, which effectively tells the tale of your colonisation of an alien world. And, as of now – the game will be out by the time you read this – you can play Sid Meier's Starships, and see what happens once you come to dominate your new world and look out to the stars again.

But whereas Beyond Earth can be said to basically be Civilization with alien monsters instead of barbarians, Starships is something else again, more in the vein of classic 4X (explore, expand, exterminate, and... the other one) like the recent Endless Space and super-popular Sins of a Solar Empire. You start out with a single planet, and a single fleet, and must explore the galaxy about you to claim your Federation.

There are some interesting twists, though, for one thing, you're restricted to a single fleet. You can grow and expand it – and in Starships, you develop different hulls by upgrading existing ones – but it

it's a hard limit. By contrast, that fleet can move about and take actions for as long as crew morale holds up. It's possible to go to multiple planets in a single turn, before you need to end the turn by taking Shore Leave, thus resting up your crew.

One interesting twist in the game is that while combat is always a part of the dealing with new planets, you're not fighting the planet itself. Rather, you're performing a mission on their behalf, like beating pirates, protecting a colony ship, or stopping and invasion fleet. In that way, it's a lot like Star Trek – friendly ship shows up, bad thing is dealt with, new planet joins Federation. Of course, it's not quite that simple: it takes a couple of turns for your influence to build up to the point where a planet will join your Federation, so you need to make sure another polity doesn't come in and start swaying them.

The game's diplomatic, research, and upgrading systems are all very basic, making combat what you spend most of your time doing. In a lot of ways, Starships may be Sid Meier game, and it may have the trappings of Civ, but it's Civ light at best. The hex-based combat is fun, but it can be very repetitive.

There are usually planets and asteroids

to negotiate, with small transient openings in dense asteroid fields, as well as wormholes and warp gates. Most weapons are effectively limitless in range, which is a nice, realistic touch, though the aforementioned space-rocks will cut down on line of sight. Some ships come with a range of weapons, which you can either remove or upgrade – you can go balanced, and have some of each, or focus on one type. There are lasers for long range, plasma for close-range and high-damage, and torpedos, which can track for multiple turns before you detonate them. Cloaking devices are countered by sensors, and the more armour you pile on, the slower you go, or the bigger your engine needs to be. It's pretty simple, but is deceptively deep, in terms of getting offensive and defensive balance just right. Much of the game's research – which are simple, linear progressions – focus around boosting weapons in one way or another.

There's no doubting that the game does have a certain one-more-turn quality to it, but it's simply not on the same level as a proper Civ title. If it were a full-priced game, it would be quite the let-down, but at just \$US14.99 on Steam, it's a nice little palette-cleanser.

David Hollingworth

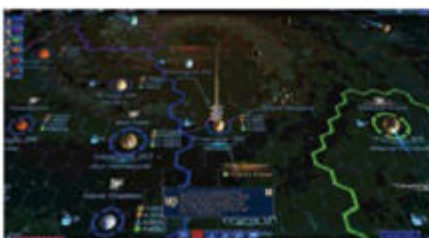
KEY SPECS

www.2k.com/games/sid-meiers-starships

Genre - Strategy • Developer - Firaxis Games

• Publisher - 2K Games • Platform - PC

OVERALL



Total War: Atilla

CREATIVE ASSEMBLY RETURNS TO FORM IN THIS VERY DARK AGES TAKE ON THE FALL OF THE ROMAN EMPIRE

For such a long-running, and in-depth series as Total War, it is perhaps surprising that there's really been only one dud game so far, that being last year's remarkably disappointing Rome II. The game is very different now, following a lot of patching by developer Creative Assembly, but it still doesn't quite feel as good as it should. Thankfully, it looks like some of the lessons learned in that process have been effectively applied in the follow-up Atilla, which is an altogether much tighter, more expansive experience.

Where Rome II ends with the rise of the Roman Empire, the beginning of Total War: Atilla sees the sprawling might of Rome split into two factions, both in a state of terminal decline. They are surrounded by barbarian tribes on the move, and upstart factions like the Saxons and Franks. The game's entire colour palette is much darker, as befits the so-called Dark Ages (note: historians of the period hate that term – you have been warned!). Fire and shadow permeate the entire game, making it truly feel as though the world – or at least the world as some knew it – was coming to an end.

As usual, there's a range of factions to play, but there's also a huge range in play-styles for each. For instance, the Roman Empires are going to lose, and there's not much you can do to change that, other than try and stick around for as long as possible. They're both vast, but have practically no resources for troop building. On the other hand, the Saxons and Franks start with a single territory, while some the barbarian nations are roaming hordes without any territory at all. There's a lot of replay value in the game.

By and large, though, Atilla uses the standard Total War formula. You manage



your growing/declining empire on a map that covers Europe, the Mediterranean and the Near East, and then go into tactical maps to fight out battles and sieges. The game continues to look better and better, and the focus on fire in the tactical games is impressive – some units will set fire to every building nearby, others can use flaming arrows, and watching armies fight it out as buildings and even forests burn is appealingly dramatic.

Units are a bit tougher, now, and are less likely to immediately break, which gives the battles a bit more sense of flow. Unit AI is a bit sharper, and enemy AI overall is now much more aggressive and clever. In tactical battles it will use cavalry units to exploit your flanks, while on the campaign map, it's even now capable of at last utilising invasion fleets. Diplomacy still seems a bit flakier than we'd like, and trade and such continues to be impossible to really understand – it just happens, and beyond Trade Agreements, there's not much you can do to influence how to make best use of resources within your control.

I'm also still not sure that the system of provinces and regions, introduced in Rome II and still here, really brings anything to the game, either, but at least the hard to recognise unit cards have been replaced by artwork that more clearly delineates your troops. Those with a knowledge of the period may find some of the unit choices a little odd, like the preponderance of Norse troops in Saxon armies, but by and large there's a rich range of infantry, cavalry, and more amusing units – such as war-dog handlers – to employ. And the ever-growing close-up detail of the individual units is nothing short of stunning. Down at ground level, in the middle of an intense melee, you could be forgiven for thinking you're in some highly-detailed first-person game.

Overall Atilla is the game that Creative Assembly needed to release, and it's a lovely reminder of what the company is capable of. With the year ahead, we're hopeful for not only Total War: Arena, an online only title, but also the long-rumoured Total War: Warhammer, which Creative and SEGA have already started teasing about.

David Hollingworth

KEY SPECS

www.website

Genre - Strategy • Developer - Creative Assembly • Publisher - SEGA • Platform - PC

OVERALL



The A-List

ONLY THE BEST OF THE BEST MAKE IT TO PC & TECH AUTHORITY'S A-LIST

There are no changes this month in the A-List. Are you getting sick of seeing the iMac sitting there as the best PC desktop after all this time? We sure are... There's nothing we'd like more than to gleefully tear it from this page and cast it asunder into the burning pits of computer hell, what with its quietly condescending 'screw you, stupid Windows box', attitude. All smug and shiny, posing like a catwalk model with sublime pride and hyper-irritating quiet confidence...

The day will come, iMac, when a desktop PC matches your refined elegance, your eye-catching beauty, your harmonious integration of form and function. Go on, sit there comfortably thinking you own the world, but one day the *actual* PC will rise, and who will be relegated to the corner of the office as a printer server then, huh!?



PC DESKTOP

ALL-IN-ONE
Apple iMac 27in

★★★★★

PRICE \$2199

SUPPLIER www.apple.com/au

If you can afford it, the 27in iMac is the finest piece of all-in-one engineering on the market. A truly powerful beast with performance to match its looks.

SPECIFICATIONS 3.2GHz quad-core Intel Core i5; 8GB DDR3 RAM; 1TB Western Digital Caviar Black HDD; NVIDIA GeForce GT 750M 1GB; 27in 2560 x 1440 LCD.



PERIPHERALS

WIRELESS ROUTER Netgear
Nighthawk X6 AC3200

★★★★★

SUPPLIER www.netgear.com.au

Designed to keep pace with high-bandwidth content consumption, it is the router King.

SPECIFICATIONS 1GHz dual core processor with 3 offload processors, 6 High performance antennas, one 2.4GHz band and two 5GHz Wi-Fi bands

DESKTOP STORAGE CalDigit T3
with Thunderbolt 2

★★★★★

SUPPLIER www.amazon.com

The T3 is an expensive RAID device, but when you factor

in the drives and the capacity included, it's good value.

SPECIFICATIONS 6/9/12/15TB external hard disk with RAID; Thunderbolt and Thunderbolt 2; 135 x 241 x 116mm 4.5kg.

NAS Synology
Diskstation DS214play

★★★★★

SUPPLIER www.synology.com

The fastest NAS in our group test (PC&TA 197), with excellent media streaming capabilities.

SPECIFICATIONS 2.1GHz Intel Atom; 2GB RAM; 2 x USB 3 + 1 x USB 2; iOS and Android mobile apps; RAID 0, 1, 5, 10; JBOD.

ALL-IN-ONE PRINTER

Canon Pixma IP 8760

★★★★★

SUPPLIER www.canon.com.au

This Canon can do it all, and at a reasonable price.

SPECIFICATIONS 9600 x 2400dpi print; 2400 x 4800ppi scan; USB 2; 802.11n WLAN; 150-sheet tray

LASER PRINTER Dell B1160w

★★★★★

SUPPLIER www.dell.com.au

The best all-rounder in our printer group test, with excellent text printing and decent costs.

SPECIFICATIONS 1800 x 600dpi resolution; USB 2; Wi-Fi; 150-sheet input trays; 331 x 215 x 178

 Thermaltake
COOL ALL YOUR LIFE

TOUGHPower
DPS-G



AVAILABLE IN
• 650W • 750W
• 850W • 1050W

LAPTOPS



VALUE Asus TF103C

★★★★★

PRICE \$429

SUPPLIER www.asus.com.au

While ostensibly a tablet with a removable keyboard, it also fits tidily into the value portable category thanks to its immense usability and remarkably low price.

SPECIFICATIONS Quad-core 1.86GHz Intel Atom Z3745 • 1GB RAM • 8GB/16GB eMMC storage • 10.1in 1,280 x 800 IPS display • dual-band 802.11n Wi-Fi



PERFORMANCE Aorus X7

★★★★★

PRICE \$2999

SUPPLIER www.aorus.com

Super-sleek, light, outrageously powerful and with a spec-list that outclasses many high end desktop systems.

SPECIFICATIONS Q4-3.4GHz i7-4700HQ • 4GB/8GB DDR3L 1600, 4 slots (Max 32GB) • 17.3" Full HD 1920x1080 • NVIDIA® GTX 765M SLI GDDR5 4GB • mSATA 128GB/256GB, 2slot 2.5" HDD 500GB/750GB/1TB 5400rpm



PROFESSIONAL Apple Macbook Retina

★★★★★

PRICE \$2999

SUPPLIER www.apple.com/au

The machine that does everything right, and looks the part, too. We've chosen the top-end 2.5GHz i7 model with 16GB of RAM and a 512GB SSD plus GT 750M graphics.

SPECIFICATIONS 2.3GHz Intel Core i7; 16GB RAM; 512GB SSD; 15in 2880 x 1800 LCD; 1x USB 3; 2x USB 3; 2x Thunderbolt 2; dual-band 802.11abgn Wi-Fi; Bluetooth 4; 3G



ULTRA PORTABLE Microsoft Surface Pro 3

★★★★★

PRICE \$1549

SUPPLIER www.microsoft.com.au

Attach the Type Cover 2 and it's as good, if not better, than any 'proper' ultra portable laptop. It took three versions, but Microsoft has nailed this format. At least an i5 is recommended.

SPECIFICATIONS 1.9GHz Intel Core i5-4300U; 12in touchscreen (2160 x 1440); 8GB RAM; 256GB SSD; 802.11ac/abgn; Bluetooth 4

HANDHELDS

SMARTPHONE Sony Xperia Z3 Compact

★★★★★

PRICE \$699

SUPPLIER www.sony.com.au

In short, no other smartphone offers the same level of performance and features at this price.

SPECIFICATIONS 2.5GHz Qualcomm Snapdragon 801 SoC • 2GB RAM • 16GB storage • Adreno 330 graphics • 4.6in 720 x 1,280 IPS display



TABLET Apple iPad Air 2

★★★★★

PRICE \$539

SUPPLIER

www.apple.com/au

The iPad Air 2 is definitively the best tablet on the market right now, and rightfully replaces its predecessor on our A-List.

SPECIFICATIONS 1.5GHz Apple A8X SoC • 2GB RAM • 16/64/128GB storage • 9.7in 1,536 x 2,048 IPS display • 7,340mAh battery



EBOOK READER Kindle

★★★★★

PRICE \$109

SUPPLIER

www.amazon.com

The new model is quicker, slimmer, lighter and cheaper than before. If all you want to do is read books, its simple design and performance are perfect.

SPECIFICATIONS 6in e-Ink screen, 170g weight, 114 x 87 x 166 mm, 2GB memory, 10-day battery life. WEB ID 279534



SOFTWARE

SECURITY Norton Security 2015

★★★★★

SUPPLIER www.norton.com/security

Great malware protection and equally good legitimate software recognition

BACK UP Acronis true image 2015

★★★★★

SUPPLIER www.acronis.com.au

The 2015 version adds full-system backup and dual backup and unlimited cloud storage.

OFFICE SUITE Microsoft Office 365 Home Premium

★★★★★

SUPPLIER www.microsoft.com.au

The easiest to use Office to date.

WEB DEV Adobe Dreamweaver CS6

★★★★★

SUPPLIER www.adobe.com.au

This edition makes PHP and CMS its core focus.

AUDIO Cubase 7.5

★★★★★

SUPPLIER www.steinberg.net

The addition of better filters solidifies this program's continued place on the A-List.

VIDEO Sony Vegas Movie Studio HD Platinum 11

★★★★★

SUPPLIER www.sony.com.au

May not have the bells and whistles of other consumer editing packages, but its tools are efficient.

PHOTO Adobe Photoshop Lightroom 5

★★★★★

SUPPLIER www.adobe.com.au

An excellent tool for photo management and light editing, as used by the pros and now available at a very reasonable price.



Our 7 Year Manufacturer Warranty ensures you have peace of mind. We are confident that our DPS G Series PSU will provide you years of enjoyment and unmatched reliability.



Delivering between 87%-92% efficiency under real-world load conditions, the DPS G promises the lowest power losses. In addition, the DPS G Series has been optimized to work with Intel's new fourth-generation Haswell processors to achieve maximum energy savings.



The Kitlog

DREAM BUILDS WITH REAL GEAR.

Change! Some for the better, but mostly for the worse... A couple of interesting new components have been added. We've finally jumped up a couple of cores to the 6-core (plus 6 logical) Core i7 5820K CPU for the Perfect PC. It won a Best Buy in this issue's CPU group test, and the price difference over the previous 4-core i7 4790k is a relatively measly \$60.

That necessitates a new motherboard to support the CPU's 2011 v3 socket. In comes Gigabyte's X99 SOC Champion. Ostensibly an overclocker's board, we see it instead as a product featuring impeccable over-engineering, like ultra-high amperage mosfets and with that a very low failure rate, and that makes it a wise choice. It does not have particularly awesome audio – but as we're using the excellent Sound Blaster ZXR it doesn't matter. Nor does it include Wi-Fi, but that can be added and we don't believe a Wi-Fi module in a desktop adds anything for most users anyway, who will be using their modem/router for this task.

Another plus the X99 SOC Champion brings is having 40x native PCIe lanes, compared to 16x on the Z97.

But the bigger news is the impact of the Australian dollar's fall over the last couple of months. Most component costs have risen, some by up to 20%. The Game Box, as a result, jumps from \$2691 to \$3023, while the Perfect PC is up to \$5243 from \$4998 two months ago.

Given the slim margins that computer distributors and resellers operate on there's just no room for them to absorb the increased cost of importing gear, so we have to wear it. It's all a timely reminder that PC components are commodity items, and a likely slump in sales with have a knock-on effect through the wider economy.

Interestingly, every product on the previous page (A-List) remains unchanged – with the exception of the Macbook Retina, which sees a very slight price drop. Systems have a greater profit margin than components, so for now rising costs are being absorbed by resellers and distributors of these products.

THE GAME BOX

CPU



INTEL CORE I5 4690K

PRICE \$324

Ripping along at a stock speed of 3.5GHz, this 'K' model allows easy overclocking for even more performance.

MOTHERBOARD

ASUS ROG RANGER

PRICE \$279

Fully featured, extremely well engineered. Alternatively, the MSI Gaming 7 or Gigabyte Z97X-UD5H are equally as good at the same price.



MEMORY



KINGSTON HYPERX BEAST 16GB

PRICE \$219

Our roundup award winner, it's well-priced, fast and overclocks very well.

VIDEOCARD

NVIDIA GTX 970

PRICE \$500

Quiet, sips power, but when the performance is needed this blazer eats up the frames.



THE PERFECT PC

CPU



INTEL CORE I7 5820K

PRICE \$535

Six cores, plus an additional six Hyper-Threading cores.

MOTHERBOARD

GIGABYTE X99 SOC CHAMPION

PRICE \$420

Supreme engineering and component quality for rock solid reliability.



MEMORY



CORSAIR DOMINATOR PLATINUM CMD32GX3M4A2133C9 32GB

PRICE \$640

These memory chips are hand selected and tested, and 32GB of fast RAM will keep things smooth and fast in intensive tasks.

VIDEOCARD

NVIDIA GTX 980

PRICE \$799

It's a pure powerhouse, with the fastest single-GPU performance available today, and with support for advanced lighting and VR.



Thermaltake
COOLING YOUR LIFE

**TOUGHPower
DPS-G**



AVAILABLE IN
• 650W • 750W
• 850W • 1050W

TOTAL: \$3023 RIG ONLY: \$2205

COOLER



COOLERMASTER NEPTON 140XL

PRICE \$120

Easy to install AIO CPU cooling, relative quiet and performance to rival twin-radiator units.

CASE



BITFENIX RONIN

PRICE \$99

BitFenix continues to deliver great budget cases that look terrific and are easy to build in.

SYSTEMDRIVES

SAMSUNG 850 PRO 512GB

PRICE \$449

Samsung's newest SSD offers greatly improved durability. Supplement it with a hard drive of your choice if needed.



KEYBOARD

CORSAIR K70

PRICE \$170

The glorious perfection of mechanical keys with well thought-out gamer design.



DISPLAY



LG IPS277L

PRICE \$499

27 inches of IPS glory. The resolution isn't perfect, but the price is. The thin bezel makes this a very attractive screen.

MOUSE



TT SPORTS VOLOS

PRICE \$79

The easy first choice at PC&TA HQ where we play hard and test every mouse. Also superb value.

AUDIO

TT ESPORTS CRONOS

PRICE \$80

Fantastic set of headphones that delivers great 2.1 audio for gaming and music without swamping you with bass.



SOUND BLASTER X-Fi XTREME

PRICE \$80

The best positional game audio at this price and good music quality.

POWER SUPPLY

COOLER MASTER G750M

PRICE \$125

Outstanding value for money, it's powerful enough for even performance PCs packing twin GPUs.



TOTAL: \$5243 RIG ONLY: \$3991

COOLER



CORSAIR H105 WATER COOLER

PRICE \$160

Best-of-breed cooling plus nice and quiet equals a happy CPU.

CASE



COOLER MASTER COSMOS II

PRICE \$400

The only case you'll ever need. Premium luxurious bliss.

SYSTEMDRIVES

SAMSUNG 850 PRO 1TB SSD

PRICE \$749

Our Labs winner is fast and durable with a wide choice in capacities.



SEAGATE BARRACUDA 2TB

PRICE \$100

Supplement the PRO with cheap HDD storage.

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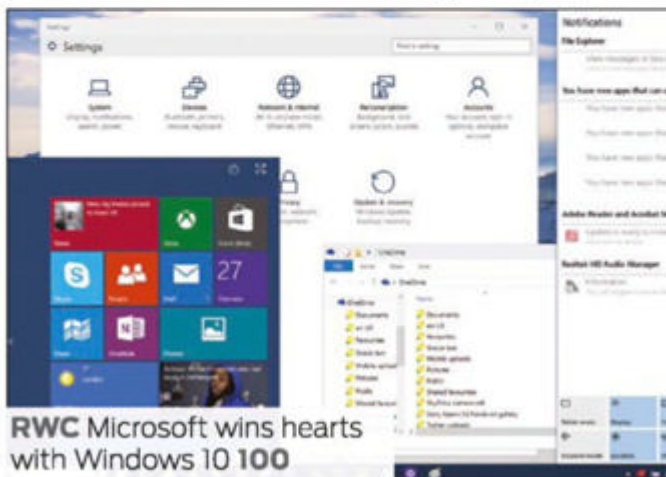
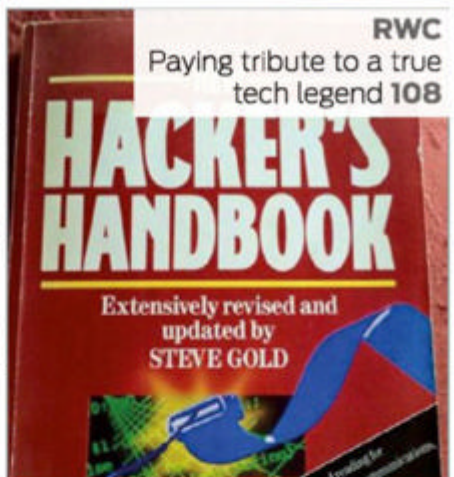


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THE BACK SECTION

It's the section where the real world experiences of our writers shines, and more than a few valuable lessons are to be learned.





GIVE YOUR PC A HEALTH CHECK WITH SPECCY PROFESSIONAL

Darien Graham-Smith discovers how this handy tool can help you improve stability and performance

It's easy to take a computer's health for granted, but as with our own wellbeing it makes sense to keep a regular eye on key health indicators – and that's where tools such as Speccy Professional, included with the download edition of this month's magazine, prove their worth.

Speccy is a tool for auditing your PC's components and settings, including many details that aren't otherwise accessible within Windows. And there are many reasons you might want to know what it has to say. It can help you identify when your system isn't operating at peak performance. It can provide a valuable early warning if things aren't working as they should, so you can take action before failure strikes. And, if you're looking to sell your system, it's a great way to list exactly what's inside.

Here, we provide a step-by-step health check of your PC, using Speccy.

KEEP THAT CPU COOL

When you open Speccy Professional, you'll see an overview of your OS and your PC's main components. You can click the individual headings at the left to open up a detailed view of the various aspects of your PC.

Start with the CPU view: here you'll see the technical details of your processor, with small blue arrows next to section headings that can be clicked on to reveal additional detail.

You'll also see the processor size, shown in nanometres: CPUs made to a smaller scale are more electrically efficient, so they can run at higher speeds without drawing too much power and overheating.

Indeed, it's temperature that's of key importance in this pane. The ultimate concern is that if your CPU is running too hot for prolonged periods, it could become damaged. In practice, processors tend to simply shut down when they get too hot – so if your computer is overheating, it's likely to become unstable.

Different chips support different temperature ranges, but the

"junction temperature" (that is, the maximum) for a modern CPU is normally between 90°C and 100°C. If your CPU is often up around here, it's cause for concern.

Even if your processor isn't getting so hot as to shut down, too much heat can affect your PC's performance. If your CPU features Intel's Turbo Boost technology, it won't kick in – or will do so only to a limited extent – if the chip is above a certain temperature, to avoid overheating.

Speccy Professional shows the average temperature inside your CPU, colour-coded from yellow to red to give an at-a-glance idea of whether you should worry. If you click the two-tone green icon next to the temperature readout, you can see your processor temperature as a live graph; try running different programs and see how this affects temperatures.

For a more detailed look, click to expand the Cores section and you'll see the speed and temperature of each physical core in your system, as measured by the chip's internal sensors. You can also see if Turbo Boost is doing its job, as the frequency multipliers jump up and down in response to system load.

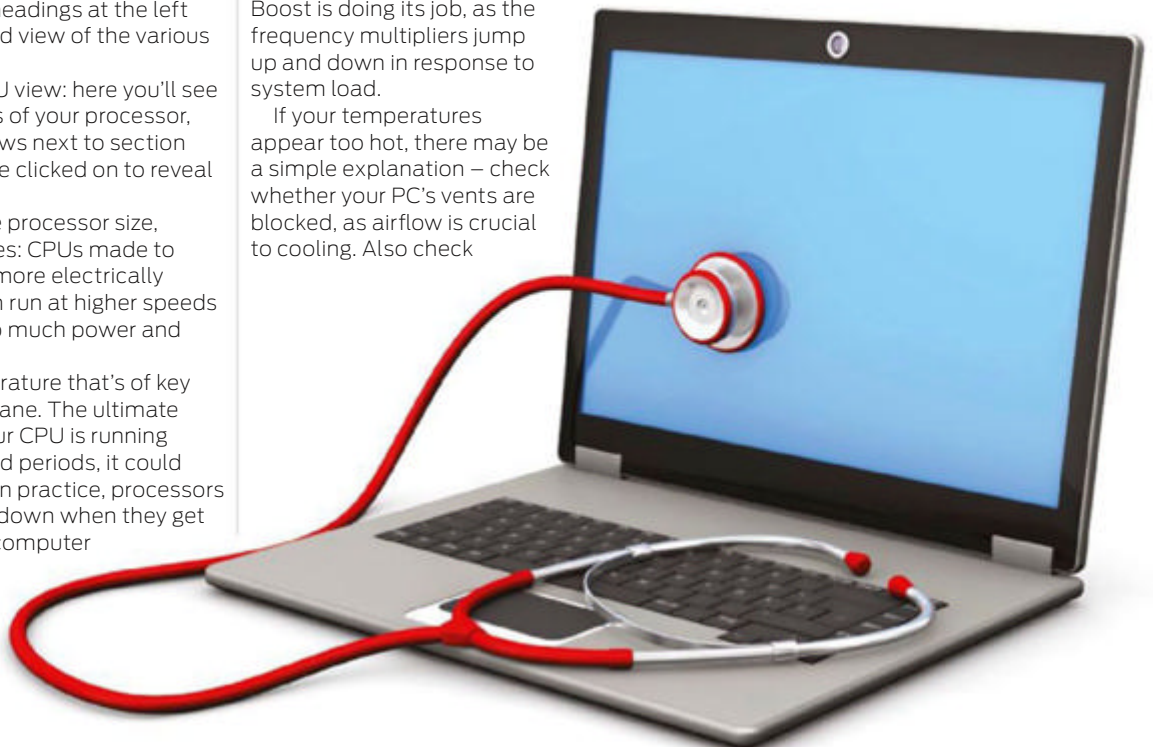
If your temperatures appear too hot, there may be a simple explanation – check whether your PC's vents are blocked, as airflow is crucial to cooling. Also check

the fan speed as reported by Speccy Professional: this shows the spin rate of the internal fan tasked with keeping your CPU cool. A spin speed of around 1,000rpm is normal, even when the computer's idle, and we'd expect to see two or three times that rate under heavy load. If it's showing as very low or zero, it suggests a hardware fault.

SMART STORAGE

The second stop in our check-up is the Storage pane, which displays a breakdown of all the drives installed in your system. Again, a huge amount of technical information is available here: for a mechanical disk, the spindle speed, measured in RPM (revolutions per minute), affects how quickly the disk can fetch data, while Power On Time gives you an idea of just how long the disk has been in use.

You can also see the Maximum Transfer mode supported by the disk, and the transfer mode it's currently using. If your disk supports SATA III 6GB/sec, but is using only SATA II, you probably aren't getting the full performance of which





TAKE CONTROL OF YOUR WINDOWS SETTINGS

As well as revealing the inner details of your hardware, Speccy Professional can deliver insight into the state of your operating system too. Click to open the Operating System pane and you'll be presented with a huge report, detailing your Windows Update settings, antivirus status, power profile and much more.

Two entries are particularly revealing. Under Scheduler, you'll find details of all the processes that have been set to run automatically at periodic intervals on your computer – these may include automatic updaters for installed applications, and nag screens that ask you to upgrade bundled software to the full edition. You can remove these items within the Windows Task Scheduler – indeed, you can audit them here too, but normally it's a case of out of sight, out of mind.

The other section that's well worth a look is Security Options. Speccy Professional collects together 95 important settings that are normally buried away in the Group Policy Editor, or otherwise accessible only by trawling through multiple Control Panel settings.

For system administrators, it's extremely handy to have these settings all in one place, along with the hardware and networking information provided by Speccy Professional. Even home users should glance down the list: for example, it's worth checking that "Guest account status" is set to Disabled so that unauthorised users can't connect to your PC remotely. "Only elevate executables that are signed and validated" is likely to be Disabled, but you might want to enable it to provide an extra layer of security.

it's capable. Check your BIOS to see if you can enable the faster transfer mode – or, in the case of a desktop system, see if you can connect it to a different SATA connector to get the full speed.

As with the CPU, temperature is key here. Manufacturers cite temperatures in the range of 50°C to 60°C as too hot for a mechanical disk, while SSDs can normally go a bit hotter: Samsung, for example, says its SSDs will work at temperatures of up to 70°C. We've seen SSDs continue to work happily at much higher temperatures, but we'd be wary of doing this regularly: if an SSD fails, it's all but impossible to recover the data.

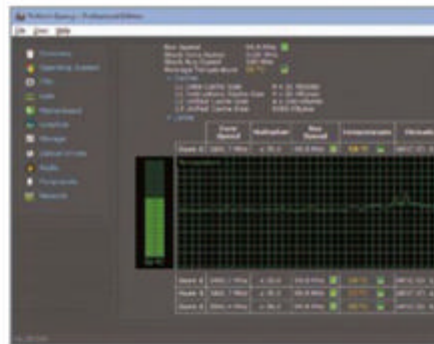
The Storage tab also lets you view the SMART data for each drive. SMART stands for Self-Monitoring, Analysis and Reporting Technology, and it's basically a

SMART attributes

	Attribute name	Real value	Current	Worst	Threshold	Raw Value	Status
01	Read Error Rate	0	118	118	50	0000F0736A	Good
05	Retired Block Count	2	100	100	3	0000000002	Good
09	Power-On Hours (POH)	143d 22h	0	0	0	0000000D7E	Good
0C	Device Power Cycle Count	135	100	100	0	0000000087	Good
AB	Program Fail Block Count	1	0	0	0	0000000001	Good
AC	Erase Fail Block Count	0	0	0	0	0000000000	Good
AE	Unexpected Power Loss	101	0	0	0	0000000065	Good
B1	Wear Range Delta	2	0	0	0	0000000002	Good
B5	Program Fail Count	1	0	0	0	0000000001	Good
B6	Erase Fail Count	0	0	0	0	0000000000	Good
BB	Reported Uncorrectable Errors	0	100	100	0	0000000000	Good
C2	Temperature	38 °C	38	48	0	0000330026	Good
C3	On the Fly ECC Uncorrectable Error Count	201,159,610	120	120	0	0008F0736A	Good
C4	Reallocation Event Count	2	100	100	3	0000000002	Good
C9	Uncorrectable Soft Read Error Rate	201,159,610	120	120	0	0008F0736A	Good
CC	Soft ECC Correction Rate	201,159,610	120	120	0	0008F0736A	Good
E6	Life Curve Status	100	100	100	0	0000000064	Good

▲ You can dig into your hard disk's self-reporting data and check its health for yourself

▼ If your system is unstable, your CPU could be overheating. Keep an eye on its temperature in Speccy Professional



means for drives to keep an eye on their own health, and warn you when they're close to failing. Your BIOS should warn you when a disk reports a warning, but it's reassuring to be able to check for yourself.

Naturally, SMART can't give you advance warning of every type of failure – sometimes, components just go pop out of the blue. But the warnings it does give are important.

By default, Speccy Professional's "SMART attributes" table is collapsed, because it's likely to contain several dozen entries, depending on the drive type. Some of these have rather obscure names (such as "wear range delta" and "life curve status"); if you want, you can read up on the various SMART attributes and learn how to interpret the reported values (see <http://en.wikipedia.org/wiki/S.M.A.R.T.>).

All you really need to know, though, is that a failure in any SMART category represents an unfixable physical problem with the disk. Take the opportunity to back up your data and order a



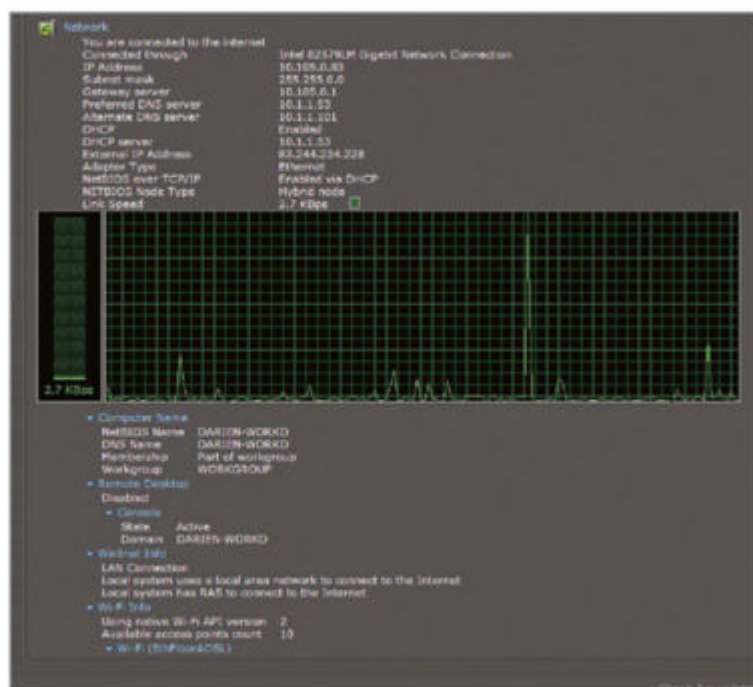
▲ Find out how fast your memory is running, and how many slots you have free for an upgrade

replacement drive.

On the topic of storage, if your system has a DVD or Blu-ray writer, this will be detailed in Speccy Professional's Optical Drives section. We're past the days when DVD-writing performance mattered greatly, but this pane also shows you a breakdown of all the disc formats your drive can read and write, including DVD-RAM, DVD-R, DVD+R and Blu-ray media. Optical discs are still popular for archival, so it's handy to know which disc formats you can use – and whether you can take advantage of dual-layer, double-capacity media.

MEMORY SPEED

One aspect of performance that's easily misunderstood is RAM speed. Click the RAM tab and you'll see full details of your memory, starting with how many free RAM slots your PC has. If you're considering upgrading, this means you



Monitoring your real-world network throughput can help you optimise your home LAN

don't need to dig out a screwdriver to discover your options.

Below this you'll see performance details. The speed of your RAM is given in megahertz; if you're using DDR3, then the effective speed will be double this frequency (thanks to the dual data-rate from which the standard takes its name). If the speed seems lower than it ought to be, you can adjust this in the BIOS, and even overclock your DIMMs if you wish. In our tests, however, we've found the benefits of faster RAM to be minimal.

Below this, you'll see a selection of RAM-timing figures, measured in clocks. The meaning of these may not be instantly clear, but they reflect the fact that memory cells don't fetch and store data instantly; timings indicate how many clock cycles it takes for memory operations to complete. If you expand the SPD section, you'll see a table indicating how many clocks of latency to expect when the DIMM is run at various frequencies. Again, it's technically possible to force a DIMM to use faster timings, but the benefit is likely to be minimal – and you may experience data errors when the module can't keep up.

WHAT'S HAPPENING ON YOUR NETWORK?

Speccy Professional's primary focus may be hardware specifications (hence the name), but it also brings together all sorts of information about your network connections, so it can help you improve the speed, reliability and security of your network.

At the top of the Network pane, you'll

see a breakdown of your internet settings, including your external IP address, which you need to know if you want to host an internet service such as an FTP server inside your home network.

You'll also see your current link speed, which you might be surprised to see is constantly fluctuating. When Windows reports your link speed, it only shows you the nominal rate of your connection, which might be 100Mbps/sec for a wired Ethernet link or, say, 130Mbps/sec for a wireless connection. Speccy Professional reports exactly how much data is going up and down the pipe, so you can check your real-world throughput (you can view

this as a graph as well). With a laptop you can even start to download a file, or copy it across your home LAN, then walk around and see how the speed varies in different parts of your home – or perhaps move your router to improve the signal.

If your computer is equipped with wireless, you'll also see details of all the wireless networks in range. You can see their relative strength – expressed as a percentage, rather than using the vague system of bars that Windows prefers – and the frequency and channel number of each, so you can check whether your own network is clashing with anyone else's.

If there are few networks around, it's recommended that you use a channel as far away as possible from the others, as Wi-Fi channels actually overlap (this is why you'll see advice telling you to stick to channels 1, 6 and 11 in the 2.4GHz range where possible).

Unfortunately, interference doesn't only come from other wireless networks; it may take some trial and error to escape interference from other electrical appliances.

At the bottom of the pane, you'll see a section headed Current TCP Connections. If you've ever wondered whether the software on your PC is "phoning home", this is where you'll find the answer. Click to expand it then click on a process name and you'll be shown the IP address where it's connected to, along with a name where available.

Hopefully there won't be any nasty surprises here, but if you've accidentally installed some sort of spyware, or an application that you simply don't trust, you can see exactly what it's up to here – and then use a firewall to selectively block it. ●

SAVE AND SHARE SYSTEM INFORMATION

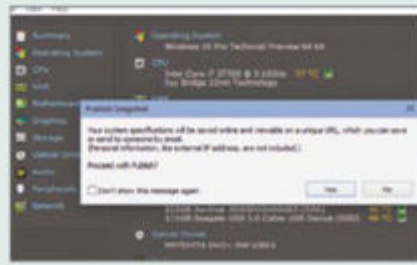
Speccy Professional isn't only for examining your PC in-place: it's also useful to save or share system information – for example, if you're selling a PC, seeking technical support or auditing PCs. Select "File | Save Snapshot..." and enter a filename to save a speccy file another user can inspect on their own PC using either Speccy Professional or the basic free Speccy package.

If you prefer, you can share a snapshot of your system configuration with a friend or colleague directly over the web, by selecting "File | Publish Snapshot...". This will generate a report and host it for you at speccy.piriform.com, from where you can simply share the URL. There's no privacy protection here – anyone with the address can see the details of your PC – but since the address of the page includes a random 23-digit code, it's unlikely anyone is going

to stumble across it by chance.

A last option worth mentioning is the ability to export a snapshot as XML. This could be helpful for IT managers, who can collect structured reports from multiple machines and then easily collate and analyse hardware and system information about entire departments.

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PROTECT YOUR VALUABLE DEVICES FROM THEFT

Don't be a victim of opportunist crime. **Mike Bedford** investigates how best to keep your laptops, tablets and smartphones out of the wrong hands

Laptops, smartphones and tablets are terrifically useful tools – but they're also valuable items that attract thieves. On these pages, we'll consider two approaches to reducing your risk of being a victim of theft. First, we'll advise on how small behavioural changes will lead to greater safety of your mobile devices. Then we'll investigate the various types of anti-theft products aimed at this sort of equipment, and examine the pros and cons of each. If the worst does happen, we'll also examine what is and isn't covered on standard insurance policies – and whether there's any benefit to taking out a specialised policy intended for this type of device.

Much of the advice given here is with the business user in mind, but that's only because they arguably have more to lose; it's perfectly applicable to personal use too.

WHAT DO YOU HAVE TO LOSE?

It's easy to ignore nagging concerns, and imagine that loss and theft happens only to other people, but according to security and communications company ViaSat, and based on data obtained from Freedom of Information requests to the UK's police forces, there were almost 300,000 thefts involving computer equipment between March 2013 and February 2014. This figure doesn't include mobile phones: a recent Home Office report covering the same period suggests that there were almost 750,000 victims of handset theft in England and Wales alone.

In order to make informed decisions, it's important to consider the potential cost of a theft. Most obvious is that of replacing the stolen hardware; you might hope and expect that this will be covered by insurance, but there are excesses and exclusions to consider – and, as we'll see later, there's even the possibility that equipment you thought was covered by your insurance policy isn't actually protected outside of your home or office. Given that a smartphone can cost more than \$1,000, and a top-end laptop aimed at the business user around \$2,500 or more, these are losses that can't simply be ignored.

Significant as these costs might be, they pale in comparison to the less tangible



potential losses, especially for business users. First among these is the cost of losing data stored on your stolen device. As a business, you have a legal obligation to keep customer data secure, so if that data is stored unencrypted on a laptop that's stolen, you could face legal consequences.

Even if you're in the clear legally, there's the possibility of consequential losses resulting from sensitive data falling into the wrong hands. There's also the productivity cost of lost information to consider: while it's great to have a regime of backing up data on a desktop PC, on removable storage, or in the cloud, this doesn't always negate the loss. There's a limit to how frequently it's viable to back up, so there's always a risk of losing a day's work, or the valuable information gleaned in the meeting you've just walked out of.

Consequential losses go beyond the loss of data too. In business, time is money, so if the loss of your laptop means you're unable to work effectively until it's replaced,

"In business, time is money, so if you're unable to work effectively until equipment is replaced, it represents considerable cost"

that could represent a considerable cost to your business. If those days of reduced productivity happen to fall within a business trip abroad, there's the cost of wasted flights and accommodation to add to the ever-growing tally. Finally, but no less importantly, don't forget that someone stealing your phone can rack up a huge bill if you don't promptly report it to your network operator as stolen.

BEHAVIOURAL CHANGES

You can do a lot to protect your devices from theft simply by making some minor behavioural changes. Some are common



▲ SmartWater enables you to paint marking onto your equipment, making it easier to identify if it's been stolen

◀ You can apply a unique serial number to your equipment

sense, but may be easily forgotten in the business of everyday life. Others might be ones you may never have considered.

One of the simplest but most effective ways to reduce the risk of theft is to avoid advertising your kit to potential burglars. If you really must leave anything unattended in a vehicle, put it in the boot, rather than on display on the passenger seat. If you're walking down the street, there's no reason to have your phone in your hand. The few seconds it will take to remove it from a pocket or handbag as needed isn't going to result in many missed calls – and the maxim "out of sight, out of mind" certainly applies from the perspective of the would-be thief.

It might seem more difficult to conceal a laptop when you're out and about, but one possible measure that's been recommended to us by a police crime-prevention officer involves carrying it in a scruffy supermarket carrier bag, rather than in a posh case. After all, who would ever suspect a carrier bag contained an expensive laptop? If you can't bring yourself to degrade your laptop in that way, at least buy a laptop backpack. It's much harder for a thief to rip one of these off your back – especially if you choose one with a waist strap – than it would be to wrest a conventional case from your hand.

If you can't disguise the fact that you're carrying expensive electronic equipment, make sure it's always in sight. Most people wouldn't dream of leaving a laptop unattended on a bus or train, but it's an all-too-common sight on intercity trains. You might feel a little neurotic carrying it around with you to the onboard shop or to the toilet, but that scenario is better than having to admit to your boss that you've had a laptop stolen.

Even if your equipment stays in view at all times, it's a good idea to make it as difficult

as possible for a potential thief to approach you unnoticed, so that an opportunist can't snatch your hardware and sprint off. Sometimes it's necessary to work in public environments, which isn't ideal, but if you do have to set up office in a busy coffee shop, try to sit with your back to the wall or, better still, in a corner.

IDENTIFICATION MARKINGS

Anti-theft hardware comes in a variety of



✓ The Lock Alarm Mini will sound an alarm if anyone tampers with, or cuts through, its cable

forms: some products aim to discourage criminals from attempting to steal your equipment, while others aim to make it difficult for them to do so; some even sound an alarm if they try. There are also products that aim to help you recover your possessions if they're stolen; then you're into damage-limitation territory. Your data, at the very least, is still at risk unless you've enforced encryption.

When it comes to discouraging thieves, the normal method is to mark your equipment in some way. Since this identifies the equipment as yours, it becomes much harder for a thief to sell it on – and they won't want to have it hanging around, since it could be incriminating.

One popular product in this category is SmartWater (smartwater.com), which you simply paint onto your kit. Its presence can be detected by the police using an ultraviolet light and, if an item is shown to be marked in this way, it can be analysed by the manufacturer to discover its precise chemical formulation. Since every customer is sent a unique batch of SmartWater, this positively identifies the owner of the equipment. SmartWater itself isn't normally visible, so it's supplied with warning labels that you stick onto your equipment.

Simpler approaches include identification stickers that attach using strong adhesive, which is impossible to remove without leaving telltale signs. You can also obtain kits containing stencils and specially formulated ink that etch an identification code into the body of the equipment. Some products mark the equipment with a name and postcode (such as idmark.com); others apply a unique serial number that is associated with the owner in a database (retainagroup.com). The advantage of this approach is that it needn't reduce the



Track tablets and smartphones via Bluetooth keyfobs

to some immovable object. Tablets and smartphones rarely have security sockets, but cases with a Kensington slot are available for some tablets, as are Kensington slot anchors that can be attached to such devices using extra-strong adhesive.

Other cable-based security solutions, such as the Lock Alarm Mini (lockalarm.com), use a thinner cable and sound an alarm if anyone tampers with or cuts through the cable. The Mobile Laptop Alarm NB-3500p from Trust (trust.com) works along similar lines, but using wireless technology: a tag is attached to the laptop, and you place the corresponding key fob in your pocket. If the tag is separated from the key fob by 5m or more, the alarm sounds.

For smartphones and tablets, it's also possible to obtain key fobs that track the devices using their built-in Bluetooth connection, so you don't need a separate tag – see, for example, the Kensington Proximo Key Fob Bluetooth Tracker. These devices won't prevent a thief from grabbing your laptop or phone in the first place, but it's unwise to rely on only a single means of protection, and alarms can make a useful addition to the mix.

INSURANCE

Strictly speaking, insurance isn't about preventing theft, but mitigating its impact. However, part of protecting yourself against the risk of theft is ensuring that

“Most insurers impose a single-item limit – a maximum amount they will pay for an individual item, regardless of its value”

your equipment is covered. We spoke to the Insurance Brokers' Association, which provided the following advice.

First, don't assume that equipment will be covered under either your home contents or business policy when it's away from those places. Some contents insurance policies can be extended to cover this, but do check first. If you use your own personal equipment for work, it too may not be covered under your home contents insurance, although it may be protected under your employer's policy.

Most policies also won't cover you if you leave your property for a long time, usually around 30 days in a row. The bottom line is, if you've taken out a standard policy and haven't checked what's covered, you're setting yourself up for a nasty surprise.

You should also be aware that most insurers impose a single-item limit – a maximum amount they'll pay for any individual item, regardless of its value. If that's a problem, you may be able to take out a specialised gadget insurance policy, covering more expensive single items and offering quick replacements for important portable items.

Finally, most standard business insurance policies won't cover the loss of data and productivity, although specialist policies exist that will cover these losses as part of business interruption. You should speak to a broker so they can find a policy that covers their needs. ●

secondhand value of the equipment, since the new owner can be registered in the database. Depending on how conspicuously you want to mark your device, these codes can be placed unobtrusively on the bottom of a laptop; there's more reticence to place these on phones, but products with smaller text are certainly available.

PHYSICAL LOCKS AND ALARMS

Most laptops have a Kensington lock slot – a connector named after the laptop security company (kensington.com) that, for more than 20 years, has made steel cables that secure the computer

SAVE AND SHARE SYSTEM INFORMATION

If the worst should happen, and your laptop, tablet or smartphone is stolen, it may not necessarily be lost for good. There are various utilities available that use a device's geolocation capabilities to track it down: these include Apple's "Find my device" service and Google's Android Device Manager.

A more integrated option is a software utility called Prey, which provides a single dashboard from which you can track Android, iOS, OS X, Windows and Linux devices. What's more, since it doesn't cost a penny, there's no good reason not to give it a try.

To set it up, simply visit preyproject.com, install the software and register

each device in turn. Thereafter, if a device is subsequently stolen, simply flag it as such on the Prey website. After that, whenever the stolen equipment is switched on, Prey uses the identity of nearby Wi-Fi access points to pinpoint its location. You can then view periodic reports online, showing you the location of your equipment, screenshots that might be informative or incriminating, and perhaps even with a photo of whoever has been using your equipment.

If this doesn't result in its recovery, you have other options at your disposal: you can instruct Prey to sound an alarm on your equipment and warn the user that they are being observed – or,

alternatively, offer a reward for its return. However, it would probably be wiser to issue a command to lock the laptop to ensure any sensitive information doesn't fall into the wrong hands.



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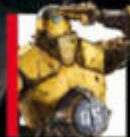
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OF THE
STORM**

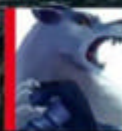
CAN BLIZZARD'S "HERO
BRAWLER" COMPETE
IN THE CROWDED
MOBA MARKET?

THE WITCHER 3: WILD HUNT

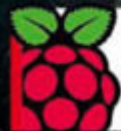
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BEN SIMPSON IT SUPPORT ENGINEER

We look at jobs in IT and talk to someone in the field

WHAT DOES YOUR JOB INVOLVE?

I'm a senior support engineer at an IT support consultancy called Microbyte. We work with a variety of small- and medium-sized businesses. I handle daily support requests from these companies; my jobs might range from sorting out printing issues to setting up Wi-Fi and internet access, as well as more complicated tasks such as configuring guest networks, provisioning broadband lines and VoIP services, and even building new servers and migrating data across from older systems.

WHAT DOES A TYPICAL DAY LOOK LIKE?

The first thing I do when I get into the office is look at my tasks for the day: we use a bespoke call-management system to assign tasks to specific engineers. We have a chap in-house who develops and does all the programming for that, so if we need to fix or change something, we can make that happen. It's a good way to work; if you use out-of-the-box software, you'll still need to pay for training, and if it doesn't perfectly fit your needs, it might not be possible to go back to the creator to get it changed.

Most of the machines we support have remote-access software installed, so I can often complete my tasks from the office. Sometimes, though, you need to visit a customer's premises: I'd say I spend approximately five hours a week on site, excluding travel time. Outside of office hours, I might also be on call, so – for example – if any requests come in between midnight and 8am, I can deal with them right away.

IS THERE MUCH OUT-OF-HOURS WORK?

If you want to work a 40-hour week it's possible; if you want to get stuck in, then there's an opportunity to put in 18 hours a day too. Everybody's so passionate here that there's plenty of out-of-hours work going on, even when there's no extra pay going for it. There are many occasions when you turn up to the office at 9am to find your colleagues have been there for two hours already. It's

“Obviously you need a degree of technical expertise, and the ability to keep up with the technologies being used by customers”

a committed environment – there are nine of us working in the same room, so everybody's really engaged with everything that's going on.

HOW DID YOU GET STARTED IN IT SUPPORT?

I've always had an interest in PCs and networked systems. Since the age of 12 or 13, I used to build computers at home, and made myself little networks.

At college I gained a Diploma in Multimedia, so that tied into my interest in technology, although it probably isn't directly relevant to how I ended up in this role. On my return after some time spent travelling, I found that a friend was already working here. He knew I was the sort of person who often stayed up until the early hours playing with PCs just for personal interest, so he suggested I apply for a job, and it

all worked out.

I started off as a junior support engineer – everyone here begins with simple work such as call logging, and taking care of small jobs such as resetting passwords and setting up basic profiles. At six months, an evaluation follows where they see if you've shown commitment and dedication, and whether you can deal with all the different types of job that come in. If all goes well, you can then move up to a senior position, take on more responsibility and start doing regular out-of-hours work.

WHAT ADVICE WOULD YOU GIVE TO SOMEONE INTERESTED IN WORKING IN IT SUPPORT?

Obviously you need a degree of technical expertise, and the ability to keep up with the technologies being used by your customers. You also need to be good on the phone – an effective support engineer needs excellent questioning skills, and also an ability to think laterally to work out what the customer actually means, rather than what they're telling you. Personally, I enjoy the challenge of trying to get to the bottom of what's causing the customer's problem.

WHAT'S THE PAY LIKE?

Around here, junior staff tend to come in at around \$45,000. Seniors such as myself go up into the \$60,000 region, and once you get further involved in big projects, you might be looking at \$90,000 or even more.

There's also the potential to generate work off your own back – you might land a contract with a customer to carry out a specific project, and receive a bonus for that, or the opportunity to earn some overtime. That can apply even if it's something we don't normally deal with: recently, for example, a colleague was talking about the possibility of putting up dishes on a radio mast to extend the range of a wireless network. Two days later, it's in the office being configured.

WHERE TO START

- Microsoft Exam References (<https://www.microsoft.com/learning/en-us/book.aspx>): learn not just the how, but also the why!
- Online video training (cbt nuggets.com)
- Keep your ear to the ground on technology blog sites for the latest developments and reviews





BROADBAND FROM SPACE: THE RACE TO SATELLITE INTERNET

Elon Musk and Richard Branson are squaring off in low Earth orbit as they battle to deliver broadband to the world. **Nicole Kobie** explains

Here's how to annoy rural Aussies: give Martians faster broadband access. Elon Musk, the forward-looking mastermind behind SpaceX and Tesla electric cars, wants to build a satellite internet system that could reach Mars – and he has competition from Richard Branson's Virgin Media.

The idea may sound crazy, but broadband networks have taken to the skies of late, with Google testing connectivity via weather balloons and, along with Facebook, investing in internet-delivering drones (see Broadband by balloon, opposite). Here's how the new breed of satellites will deliver broadband from space.

IMPROVING SATELLITE INTERNET Satellite internet already exists, but Musk's proposed system is different: it would use thousands of micro-satellites, which is around ten times as many satellites as Iridium's network – currently the largest in the world.

Each of Musk's satellites weighs around 113kg, less than half the mass of standard satellites, which orbit at a 35,000km height. The new satellites will be launched into low Earth orbit, which is only 750km from the surface of the earth. That will improve latency, a major challenge with existing satellite internet: from low Earth orbit, latency is predicted to be around 30ms, compared to the typical 500ms latency experienced by existing satellite internet customers.

Micro-satellites also cost less: \$700,000 to build and launch, as opposed to the tens of millions of dollars of larger ones. Getting them into space is another issue, but both Musk's SpaceX and Branson's Virgin Galactic are working on cost-effective ways to deliver payloads into orbit.

SPACE RACE

At the start of 2015, Richard Branson announced that Virgin was working with Qualcomm and OneWeb in the UK to build such a network, using its own Virgin Galactic launcher programme.

"We have the biggest order ever for putting satellites into space," Branson said at the launch of the project. "By the time our second constellation is developed,

the company will have launched more satellites than there currently are in the sky."

Key to that system is OneWeb founder Greg Wyler, who many expected to work with Musk on his satellite internet plans – not least because the pair are close friends. However, Wyler has signed up to work on Virgin's competing project.

"Greg and I have a fundamental disagreement about the architecture," Musk said in January. "We want a satellite that is an order of magnitude more sophisticated than what Greg wants. I think there should be two competing systems."

Branson disagreed. "Greg has the rights [to spectrum], and there isn't space for another network – like, there physically isn't enough space," he responded. "If Elon wants to get into this area, the logical thing for him to do would be to tie up with us, and if I were a betting man, I'd say the chances of us working together rather than separately would be much higher."

Work on the two projects is only now ramping up: with both reportedly on hiring sprees, now is a great time to be a satellite engineer. Musk expects the final project to cost US\$10 billion, and he's already won US\$1 billion in investment from Google and Fidelity Investments, although his system will take at least five years to become operational.

BROADBAND FOR THE MASSES

Despite the costs, Musk believes the space network could pay off, seeing it as potentially funding work even further afield. "We see it as a long-term revenue source for SpaceX to be able to fund a city on Mars," Musk said at a SpaceX event in January. "It will be important for Mars to have a global communications network as well. I think this needs to be done, and I don't see anyone else doing it."

Closer to home, the networks – as well as broadband connectivity projects using



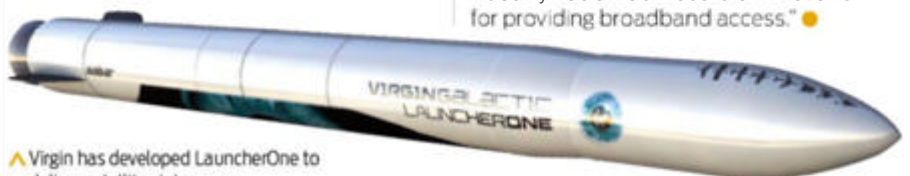
▲ Elon Musk and Richard Branson are in a race to deliver broadband from space

balloons and drones – are designed to bring online the three billion people around the world who are yet to gain any form of internet access.

IHS iSuppli analyst Ian Fogg sees this as the "connecting seam" between all of these extreme-sounding projects. "Today, connectivity and access to the net is as important, or becoming as important, as having power or having access to food and water," Fogg said. "It's becoming a utility that's important, if not essential, for regular society and the economy... And that's true in America; it's true in Africa; it's true in Australia."

Such programmes are designed to bring broadband to the billions of people around the globe who don't yet have internet access – and, in Musk's case, to Mars. But could they also help those in rural Britain who struggle to get decent connections?

"Satellite internet is just one of the technologies that could be used to bring broadband to the hardest-to-reach areas," suggested Nicholas Lansman, secretary general of the UK's Internet Service Providers Association. "Industry is determining the best solutions for the most rural areas and there's a £10 million government fund looking at technologies for rural broadband. Only time will tell whether Musk's proposals will be successful or not, but the internet industry has a track record of innovation for providing broadband access." ●



▲ Virgin has developed LauncherOne to deliver satellites into space



COMING UP... PROJECT PHIRE

Gorilla Glass is strong but still prone to scratches. Corning hopes that with Project Phire it will be able to add a final layer of protection with a scratch-resistant glass based on sapphire

Smartphones with scratched glass could go the way of physical keyboards and flip phones, if Corning has its way. Corning has long claimed that its own toughened glass, Gorilla Glass, survives better if dropped than glass made with synthetic sapphire – but the latter is far more scratch-resistant. This is one of the reasons behind Apple's plans to use sapphire glass for its Watch; the company has already switched to using sapphire for the iPhone 6's fingerprint scanner.

Apple's sapphire supplier, GT Advanced Technologies, filed for bankruptcy last year, giving Corning the opportunity to get ahead in this market. And the signs are that the company has succeeded. James Clappin, president of Corning Glass Technologies, told us that his firm has created a new version of Gorilla Glass,

dubbed Project Phire, which offers the same level of toughness as Gorilla but has "scratch resistance that approaches sapphire".

Not only will this expand Corning's portfolio, with glass that can be used on smartwatches and camera lenses, it may also be used to front smartphones. Real sapphire is too expensive to use as a display cover for all but a few niche ruggedised or luxury handsets; Apple was reported to be considering it for the iPhone 6 and 6 Plus, but its supplier couldn't make enough.

While Corning has said that Project Phire glass will be made available to suppliers later this year, it's still unclear how much extra it will cost compared to Gorilla Glass – and whether Corning can create enough to satisfy the demands of smartphone makers.

INTERNET DRONES

Facebook is turning to drones to deliver internet around the world – but these won't be toy-like devices. Facebook expects them to be the size of 747s and fly for years at a time. Like Google's Project Loon balloons (see Broadband by balloon, right), they'll take to the air above commercial aircraft and weather.

Yael Maguire, engineering director at Facebook's Connectivity Lab, told a Mashable conference that the company hopes to test its internet drones in the

US this year, but it's also looking at other countries. To help it achieve that, Facebook last year bought Ascenta, a British firm that holds the record for the longest-flying solar-powered drone. It expects to have the planes delivering internet connectivity within three to five years.

Facebook isn't the only company looking at internet drones: alongside its own Project Loon and investment in Elon Musk's satellites, Google has acquired Titan Aerospace, which makes solar-powered

BROADBAND BY BALLOON

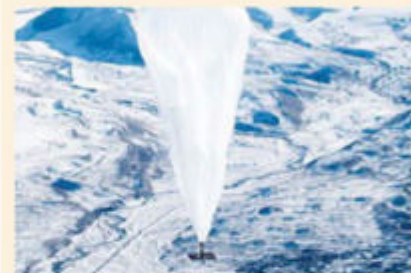
Rumour has it that Google gave Project Loon its name because it's such a loony idea, but trials have suggested it may just work. Project Loon sends a network of 15m-tall polyethylene balloons – more like weather balloons than those you'd find at a birthday party – up to the edge of space. There, they move around by rising or lowering in the wind, and provide an LTE signal to users below.

People can connect directly to the helium-filled balloons via any LTE device, with the signal routed via a 10kg box that sits at the bottom of the balloon, housing the necessary circuitry, antennae and solar-recharged batteries.

Loon was first piloted in New Zealand in June 2013, and has since seen successful trials in California and Brazil. It may seem rather unlikely to get beyond the trial phase, but a year after launch, Google X project director Mike Cassidy told Wired: "We've definitely crossed the point where there's a greater than 50% chance that this will happen."

His colleague Astro Teller, who heads the Google X division, was even more optimistic, claiming the balloons were offering ten times more bandwidth than expected – up to 22Mbps/sec to an antenna on the ground or 5Mbps/sec to a handset, speeds many would be happy with.

Saying telecoms companies are already showing interest, Teller predicted people in several countries would be connecting to balloons for internet service as early as summer 2015.



drones. Titan's unmanned craft have a wingspan of 50m and fly at an altitude of 65,000ft, and the company has previously said it will be able to deliver 1Gbit/sec speeds at some point in 2015.

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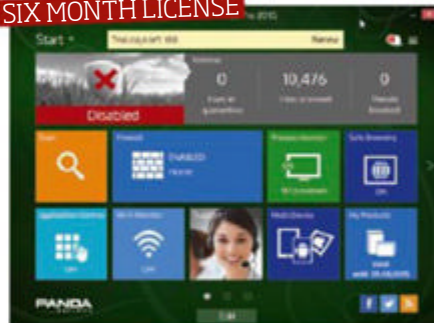
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PANDA ANTIVIRUS PRO 2015

Panda Antivirus Pro 2015 is a powerful antivirus tool, highly rated by independent testing labs, which also provides a stack of extras to help keep your PC safe. The program's use of smart cloud technology makes it lightweight, fast and easy to use. Most detection is carried out on Panda's own servers, so there's minimal load on your system, and threats are blocked just as soon as they're discovered - no waiting for your daily update.

Antivirus Pro 2015 goes further, though, using heuristics and behavioural analysis to uncover and block even unknown viruses. And the results can be impressive, with labs like AV-Test and AV-Comparatives often giving Panda 100% protection scores during their 2014 tests.

Unlike most of the competition, Panda Antivirus Pro 2015 comes with a firewall. It's not the most complex or configurable, but it's certainly easy to use, and it'll protect you from network attacks while you're online.

Detecting malware is great, but avoiding it in the first place is better, which is why the program also comes equipped with strong browsing protection. This watches the URLs you're trying to visit, however they're launched (browser, email, a link in a document), and immediately blocks access to phishing or malware sites.

Antivirus Pro's Wi-Fi monitor displays everything connected to your network: PCs, laptops, tablets, phones, whatever you've got, making it easy to spot intruders.

Application Control is a whitelisting tool which allows only trusted applications to run. It's more drastic, but offers great protection if you generally use the same few programs, as nothing else can be launched without your permission.

And the bonus features just keep coming, with a virtual keyboard to help bypass keyloggers, a "USB vaccine" which

protects your USB keys from infection, and a bootable Rescue Kit to find and remove even the stealthiest of threats.

REGISTRATION & INSTALLATION:

- Download and run AP15.exe (32 Bit)
- Proceed with the installation process.
- Upon a successful installation, a prompt will ask for your email. Enter your email and activate when you receive an email from Panda Antivirus.

Congratulations! You now have a 6 month trial for Panda Antivirus Pro 2015!

For support of this software, please direct your queries to: www.pandasecurity.com/australia/homeusers/support/

FULL VERSION



ASHAMPOO WINOPTIMIZER 2015

Ashampoo WinOptimizer 2015 is a comprehensive PC maintenance suite which can help clean, optimise and protect your PC.

The program opens at the Overview page. Click Scan and it goes to work, quickly checking your system for problems. These might include junk files, poorly configured browser and Windows settings, broken Registry keys, space-hogging and more. Issues can be viewed individually, or you can have Ashampoo WinOptimizer 2015 resolve them all with a click.

While this is all reasonably useful, the true power of Ashampoo WinOptimizer 2015 only becomes obvious when you click the Modules button. You'll discover individual tools to manage your startup programs, control Windows services, optimise your internet connection, clean the Registry, explore your hard drive use, free up drive space, securely delete files, and a whole lot more.

Some of these modules are small. One enables you to save the icon layout on your desktop, for instance, and recall it later: that could be useful, but only occasionally.

Others are much more significant. DiskSpace Explorer analyses your system

and displays detailed reports on how your drive space is being used, perfect for locating bulky files and folders. "Tweaking" gives easy access to more than 100 hidden Windows and application settings. And "Startup Tuner" not only displays your current startup programs, but displays ratings from other WinOptimizer users to help you decide what to keep.

While most of the individual modules can only be run manually, WinOptimizer is able to run all its core cleanup tasks with a click. Alternatively, you can schedule them to run automatically at a specified time, even if you're not around.

We're a little wary of allowing any tweaking program to do that, as any mistakes could seriously harm your PC. Fortunately WinOptimizer automatically backs up any Registry changes it makes, and if you do run into problems then you're able to undo any recent tweaks in seconds.

REGISTRATION & INSTALLATION:

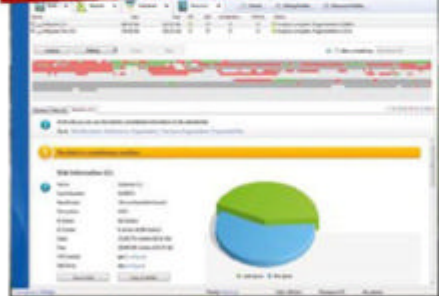
- Download and install ashampoo_winoptimizer_2015_18756.exe
- After you launch the software, a prompt will be appear requesting you to register.
- Click on "Get free activation key", this will open up a link in your default internet browser.
- Enter your email and hit the "Request full version key".

Note:

Users who have previously registered an Ashampoo product, please log in. Once you have logged in, go back to within the application and click "Request FREE full version key" again and fill out the prompts accordingly. Copy and paste your license key into the application, press next and complete the installation process.

Congratulations! You have unlocked Ashampoo WinOptimizer 2015. For support of this software, please direct your queries to: <https://www.ashampoo.com/en/aud/sup>

FULL VERSION FOR 4 MONTHS



FULL VERSION FOR 4 MONTHS AUSLOGICS DISK DEFRAG PRO 4.5

Auslogics Disk Defrag Pro 4.5 is a very powerful defrag tool which provides

everything you'll need to keep your system running at peak performance.

The program provides multiple defrag algorithms, for instance: it can optimise access according to file access time, modification time, Windows own prefetch layout, or you can even manually define which files you'd like written to the fastest part of your drive. While leaving a little free space after specified files also helps to reduce future fragmentation.

And there are even more ways to run a defrag job. So you might choose to defragment an individual file, a folder, or an entire partition; the program can run before Windows launches, enabling it to defrag system files which would otherwise be locked; a scheduler can run unattended defrags whenever you like, or you can even leave Disk Defrag Professional running in the background, so it can detect and eliminate fragmentation just as soon as it appears.

And if you're worried about the program slowing you down, then don't - it's not going to be a problem. In just a few clicks you can limit the maximum use Disk Defrag Professional will make of your CPU or hard drive. And you can tell the program not to run at all when a particularly demanding application is running, so if you launch your favourite games, say, you can be sure they'll get 100% of your system's resources.

If you don't want to pay for the commercial version, then Auslogics also have a free build available, but

unsurprisingly it's much less powerful. There's no choice of defrag algorithms, for instance. No boot-time defrag, or resource management. Scheduling is more basic, you don't get the program's fragmentation prevention mode, there are no detailed reports or performance charts, there's no special algorithms for SSD's - it's just far less capable.

So if you're in the market for a defrag tool then we'd recommend you install the trial version, if only for a while, just to get a feel for exactly what the program can do.

REGISTRATION & INSTALLATION:

- Download and install disk-defrag-pro-setup-trial120-notblock.exe
- Congratulations! You have successfully installed Auslogics Disk Defrag Pro! For support of this software, please direct your queries to: <http://www.auslogics.com/en/support/product/disk-defrag-pro/>

FREE FULL VERSIONS: Each month, we offer *PC & Tech Authority* readers full registrable versions of some software on the DVD. See the installation instructions in the DVD menu to complete registration, if applicable. **IMPORTANT:** Full product registration closes on 11/05/15



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JON HONEYBALL

"MICROSOFT IS BACK WHERE IT SHOULD BE, WITH A SOLID PRODUCT THAT'S CAREFULLY CONSIDERED, POLISHED AND WELL DELIVERED"

Windows 10 has the goods to place Microsoft back into the hearts of users, with the licensing changes of most significance

Here are some words I wasn't expecting to type any time soon: I'm genuinely excited by the Windows 10 announcements. There, I've said it. I'd been excited by Windows before - excited enough by Windows 3 to jack in my full-time job and launch my own firm specialising in supporting it. Windows NT was a joyous thing too, and NT4 was a positive delight. In the business arena, Windows XP was strong and became well understood, controlled and deployed. I didn't particularly like Windows 7, but its 64-bit version was certainly a solid update to XP.

I didn't enthuse about it simply because it didn't move anything forward in a meaningful way.

The rest have been disappointing, verging on garbage (let's not talk about versions 8 and 8.1, whose limitations and blinkered thinking still make my mind spin). Vista? Oh, perleaze. Windows 2000, especially in its server version, receives a nod for introducing Active Directory, although that didn't really work well until 2003. The various mutations of Windows 95 (ME being the worst) were adequate in a toy-like way, but paled in comparison to the NT work being done at the same time.

Now Windows 10 finally brings Microsoft back to the place where it should be, with a solid product that's carefully considered, polished and well delivered. That it's taken the company the proverbial "three versions until it's right" since the launch of Windows 8 shouldn't come as a great surprise to long-time Windows watchers - finally the grown-ups have taken back control of the Microsoft building.



JON HONEYBALL

Jon is the MD of an IT consultancy that specialises in testing and deploying hardware
@jonhoneyball

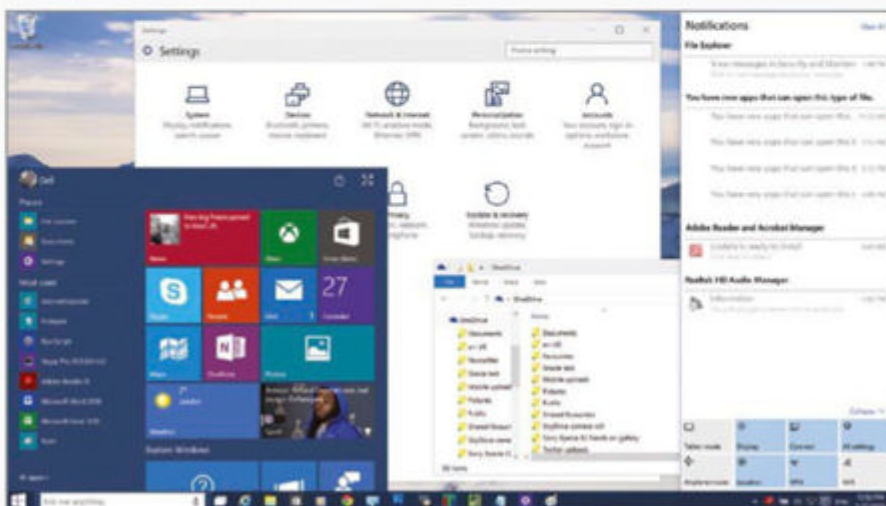
I don't say that lightly, as I'm sure the work being pushed forward by Steven Sinofsky was well intentioned, and he did have a strong history of delivering good stuff. Perhaps history will show just how much pressure he was under to deliver something, anything, as a response to the terrifying threats from Android and iOS. Perhaps the lumpen behemoth that is the Microsoft Windows team simply couldn't respond any quicker, and Windows 8 was a horrible compromise that delivered just enough to get something out the door, while recognising that it fell far short of what was needed. Who knows? The PR bunnies were spinning furiously at the time with claims that Windows 8 was utterly fantastic, but then they would say that, wouldn't they?

There's much to like here in Windows 10. There's now proper consideration of how touch can be made to work well in both the tablet and desktop spaces, and joined-up thinking about how a tablet can convert to and from the laptop function as you add or remove a keyboard. There's proper thinking too about how Modern apps can be run both

full-screen and also within a window on a desktop. Consideration has been given to how to bring the Start menu up to date in a manner that encompasses all modes of use, from the smallest tablet through to a large multi-screen desktop. But it's the licensing changes that have piqued my interest most: Microsoft has announced that, for a period of one year following the release of Windows 10, customers running 7 or 8.x can upgrade for free. This includes business customers that are running the Pro version, but excludes Enterprise version customers who will be running on a full enterprise licence, and who would therefore receive the upgrade as part of their rolling plan anyway.

This is a significant and welcome move by Microsoft. You might recall that I asked Microsoft to extend such an offer to Windows XP customers when the software finally went end-of-life last year. It turns out that there isn't actually a direct upgrade path from XP to 7 or 8 without going through Vista, so I think you'd have to agree that Microsoft painted itself into a corner with that one. Writing some sort of utility to patch

▼ The Start menu can be adapted to fit screen sizes from tablets up to multi-screen desktops



things up so that a direct upgrade could work was almost certainly viewed in Redmond as being far too much of a ball-ache to be worth the effort.

This free upgrade from 7 and 8 is to be strongly welcomed, and what's also interesting is that you'll be supported for ten years – not only for bug fixes

“Microsoft is battling with a problem of fragmentation – it needs to get all its customers up onto a common platform”

and patches, but also for new features. Microsoft has been rather less than clear about what this will actually mean in practice, however: will there be a Windows 11 coming along in a few years' time? Seems not; Windows 10 becomes “Windows” and that's it, with small, fast incremental upgrades and new features from now on, which will be free if you upgrade within this time frame.

This is all hugely important to Microsoft because it's battling with a horrible problem of fragmentation. It really needs to get all its customers up onto a common platform, including business users, so this is a one-off attempt to make it sufficiently attractive for anyone who's running versions 7 or 8 to move up to 10 for free.

What's equally interesting is the company's plan for the server side. Here Microsoft has finally woken up to the blindingly obvious point that businesses are far more cautious about upgrading, especially on their core servers. By upgrading, I mean that almost weekly flood of patches, fixes and so forth that seem to spew from the software vendors.

To help manage this, Microsoft is introducing two new “branches” of the Windows codebase designed specifically for business users. The first, called “Long Term Servicing”, is aimed at devices you want to keep patched for security and critical updates but that demand maximum stability otherwise – those mission-critical computers that must be patched but not fiddled with otherwise. This program will run for five years of mainstream support, and then a further five years in extended support. You'll be able to use Windows Server Update Services (WSUS) to control how these fixes are applied.

The other version is called “Current branch for Business” and is for customers who want not only the security patches and updates, but also the new feature updates – but only once they've assessed

> Although functionality is limited, Office for iOS and Android is useful



them for quality and compatibility and decided to press “Go”. In other words, it will bring all of the consumer updates, but in a more time-controlled manner for the managed business platform.

So has Microsoft really woken up and smelt the coffee? With Windows 10 I think there's a strong possibility that the company can regain relevance and confidence in both the business and consumer markets, but there are still a few flies in the ointment overall.

There's no ongoing strategy for Windows RT, the ARM-based version that Microsoft released on its Surface tablets. I'm really quite annoyed about this, because it's just another example of Microsoft's bad history of launching onto non-Intel x86 platforms and then walking away from them. It did it with NT, which was on four platforms originally: x86, PowerPC, MIPS R3000 and finally the DEC Alpha. Then it released the Intel Itanium CPU version, which ran throughout the 2000s.

The recent release of the ARM processor version of Windows 8 was fascinating for one reason – it couldn't run Win32 code at all, and hence was immune from Win32 malicious code. You might think this was a good idea, and indeed it was. Microsoft even ported a version of Office over onto the RT platform, although like all non-Intel versions of Windows Office platform, it was stripped of significant functions.

There will be some sort of upgrade, but it won't be Windows 10. The conclusion is obvious – Microsoft's foray into the world of ARM for Windows is dead and buried. Maybe it achieved its intended goal of encouraging Intel to pull its finger out and deliver lower power-consumption chipsets. That's undoubtedly true, but I'm not at all sure that Intel was waiting for such a push, and wasn't already doing the necessary work.

And why am I so annoyed? Because the ARM version of Windows 8 actually came closest to what Microsoft was originally trying to do with this OS. It was focused almost entirely on the new touch interface and squarely aimed at the tablet marketplace (although desktop ARM devices could certainly have been interesting). The problem, as always, was that the actual implementation was incomplete: the port of Office to the desktop UI showed just how far behind the Office group was lagging, and the fact that Microsoft made an exception solely for the Office group, to allow it to run old-style apps, showed just how deep a hole the whole project had fallen into. Never mind, it has all come to naught; yet another non-Intel experiment from Microsoft that the company has refused to stand behind.

OFFICE FOR IOS AND ANDROID

Now for the good news. The arrival of Office on iOS a few months ago was



significant because it showed that Microsoft, in its post-Ballmer incarnation, was prepared to actually think about what customers wanted, rather than just trying to corral them into buying what Microsoft wanted to sell them.

The iOS version is functionally limited of course, but it's useful for simple- to medium-weight work. Just don't try putting anything too complex near it, or you'll find that its capabilities simply don't stretch that far – some areas will render correctly, such as conditional formatting cells in Excel, but the user interface to change those settings is missing in action. Nevertheless, it's now free for personal use, with certain advanced features paywalled, and bundled as part of a personal or business Office 365 subscription.

The arrival of Office for Android is possibly even more significant, since the fact that it's now available for the two biggest tablet platforms, alongside Windows, may well represent a tipping point for those devices. I realise it might sound a bit sycophantic to prophesy about such a tipping point (and the accompanying move from content consumption to content creation) merely because Office has arrived – after all, there have been a number of pretty good office apps for those platforms for a while now – but the fact is that they haven't really grabbed the public imagination in the way that “real” Office from Microsoft will do. Suddenly, the somewhat-less-than-imaginative middle management of company IT departments is waking up to the arrival of Office for iOS and Android, and for some of them this appears to “legitimise” these platforms.

Great care still needs to be taken in using iOS and Android in a business environment, since the management tools will need to be extended to these platforms too, but it can be done. The range of hardware supported by Office for Android is somewhat limited, at least in the beta versions, and I'll need to check out how this has panned out in the final release that emerged in late January. But be in no doubt that Microsoft is now deadly serious about wanting its customers to use Office, even if it isn't on Windows itself, and this is a brave step that has to be applauded.

ONEDRIVE WOES

Now for the bad news. Despite all of the good things I've mentioned above, there are two big howlers. Let's start with OneDrive for Business for Mac, which was promised for the end of last year but then didn't materialise. Finally Microsoft

has released a beta version of this tool, which I fired up, pointed at some local storage and told it to get on with the task of creating a cloud-based copy. This was what I wanted it to do, but the experience only lasted for a few seconds before the app collapsed in a pile of smoking debris. OneDrive has a very restricted set of file types and filenames that it will tolerate, and it throws up error after error if you dare to employ any that it doesn't like. Worse still, it told me that it couldn't cope with any file bigger than 2GB, and that some of my filenames were too long.

Frankly, I despair. Yes, underlying this platform are the old SharePoint storage services, and these are in dire need of bringing into the 20th century, let alone the 21st. It seems that Microsoft agrees, because it's announced that there will soon be one unified storage platform for both OneDrive and OneDrive for Business. I can't help feeling that what the company has just released is some sort of sop to those of us who have been loudly complaining that we're paying for OneDrive Business storage as part of our Office 365 E3, and that we'd quite like either a working client or a downgrade option back to plain OneDrive. If Redmond believes that code of this rank quality, on top of an underlying platform with those restrictions, will suffice to make us happy, then I have some bad news: pull your fingers out and deliver something that business Mac users will want to use, because this really isn't good enough.

I now shift my attention to the just-released Outlook for iOS, over which I'm in a real quandary. After initial use, I'm stunned by it – it's quite amazing. The way it can categorise emails into “important” and “not important” is superb; it's fast, fluid and responsive. I entered into it a pile of Office 365 account logins, and even gave it my Dropbox login, and it just worked. It's great, and

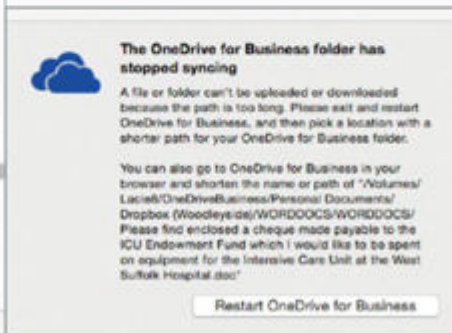
I was hugely impressed. Except for one point: this is in fact as much a “Microsoft Outlook” product as my left leg...

Microsoft bought the company behind this product only a few months ago, and has simply rebadged its code – from there it's downhill. First, this isn't a phone-centred client app, but actually a combination of a phone-based app and a cloud service. The cloud service runs on Amazon Web Services (AWS) servers, which I have no problem with because AWS is a solid platform. However, I don't recall there being any indication when I installed the “app” that this would happen. Worse still, when I give it my login information, it isn't used by the client – oh no, this login information is sent to the AWS cloud servers and they log in on my behalf. It's also the AWS cloud servers that do all the clever categorising of my emails, then send the email data back to the client running on my phone. Similarly, if I need a Dropbox file that's no problem: it will log in to the cloud and get it for me. Which means I've just handed my login information over to a third-party tool running on a non-Microsoft server platform, which is logging in on my behalf.

That might not bother you, but for people who work in a regulated environment it will be a disaster. Worse still, you have no centralised management of this information. However, Microsoft has decided that it's tickety-boo to slap a “Microsoft Outlook” label onto this technology and shove it out the door, without any attempt at re-engineering it for the Microsoft platform. I suspect there hasn't even been a proper, long-trousered security validation, and the Office blog is somewhat short on factual clarity about what's going on too.

Yes, I'm very annoyed: this cavalier rebranding and callous and deliberate obfuscation of what's going on is exactly the sort of behaviour that makes people distrust Microsoft. I do hope heads roll over it. ●

◀ Unfortunately, OneDrive for Business for Mac is unusable, throwing up errors at every turn



PAUL OCKENDEN

"I'M GOING TO SUGGEST AN ALTERNATIVE TO MIGRATING DATA AND SOFTWARE - RUN YOUR OLD PC INSIDE YOUR NEW ONE"

Virtualisation could ease the pain of migrating to a new laptop, and some cheap imported smartphones are worth a look

I'm going to start this month's column with a plea from reader Andy Young, who writes: "I'll soon be upgrading my laptop, but one of the things I always dread when I get a new PC is moving across all of my data and software from the old machine to the new one. Are there any products available that actually work for this?"

Well, there are a few bits of software on the market that claim to migrate both your data and software from one machine to another, and I've tried a fair few of them over the years with varying degrees of success, often experiencing niggling doubts about how (or, indeed, whether) they actually work. Copying documents, music, photo and video files isn't problematic, but it's usually email archives and certain bits of software that fail to migrate properly, if at all. This isn't something that affects only obscure programs – I've had trouble getting Microsoft Office and Adobe software working after having transferred it over onto a new machine.

Transferring documents across is simple – and if they've been synced to one of the cloud services then so much the easier – but software often needs to be reinstalled. This isn't an issue, apart from in those cases where that favourite bit of shareware you use every day is no longer available, and you're not in possession of its original install files. Or where it hasn't been updated for years and now refuses to run on the version of Windows on your new machine. To save Andy from such problems, I'm going to suggest an alternative method: to run

his old PC inside his new one. You may now be scratching your head, or you may have twigged that I'm talking about virtualisation.

Virtualisation enables you to run a full emulation of one computer within an application on another. It's a great way, for example, to road test new builds of an OS without completely trashing your machine. There are various flavours of virtualisation on the market. I've found Microsoft's Hyper-V to be one of those

well on both desktop PCs and the data centre; on my Macs, however, I still have a fondness for Parallels.

It doesn't really matter which product you choose, since the principle remains the same: fire up the virtualisation system and, inside a window, it will magically "boot" up another PC, including the whole BIOS sequence. The fancier products go further still, so that besides emulating the whole PC you can also just run an individual application in a window on the

host machine. The key to moving to a new PC now becomes to "virtualise" your old one, using a process known as P2V (physical-to-virtual) conversion, which makes a copy of your entire existing machine and turns it into a Virtual Machine that you can fire up on the new one.

"The fancier products go further still, so that besides emulating the whole PC you can also just run an individual application in a window on the host machine"

products that's utterly brilliant up to a point and then goes all "Microsoft" on you, being unnecessarily complicated. There are many open-source products out there, plus a few commercial offerings that tend to feature more bells and whistles. I'm a great fan of VMware for Windows platforms, since it works so

VMware offers a free download, VMware vCenter Converter, which is excellent for this task. Of course, it produces a VMware-format VM, but there are free tools available that can change this to other formats if you don't want to use VMware's desktop product. If you're doing this on a business PC and you make use of virtualised servers, then you can even squirt this P2V conversion straight onto one of your ESXi hosts.

I'd suggest that you disable all network connectivity on the VM of your old PC, so that it doesn't download any further emails and so on, or receive any OS or application updates (this isn't a security problem, because without internet access there's little chance of any nasties finding their way onto the VM). This ensures that the virtual machine remains locked to the exact state it was in when you upgraded. If you want to work on a set of files, just drag them over to the new host machine. You'll be able to run any obscure, old software inside the VM, although be aware that several upgrades down the road you could end up with a Russian-doll-like sequence of VMs inside VMs.

Premium smartphones are facing serious competition from new brands



PAUL OCKENDEN

Paul owns an agency that helps businesses exploit the web, from sales to marketing and everything in between @PaulOckenden



ALL THAT GLISTENS

If you've been interested in technology for as long as I have, you'll almost certainly be aware of Steve Gold, whether that's from his notoriety (alongside Robert Schifreen) for the "hacking" of Prince Philip's Prestel mailbox, his work on the later versions of the wonderful *The Hacker's Handbook*, as the UK custodian of Newsbytes (that very-much-ahead-of-its-time tech news service) or for any of his many gigs writing for and editing technology and information security journals. Sadly, Steve died in January, and you can read more about his career over in Davey's column this month.

Steve and I would often have robust discussions (they were never really arguments), mostly online and about one of his favourite subjects: cheap, imported smartphones. I'd be bigging up the latest and greatest shiny smartphone that I'd just reviewed, while he'd be laughing at people who go out and buy shiny trinkets from the big-name vendors such as Apple, Samsung and HTC. He'd insist that the handset he'd just imported from China didn't only cost a fraction of the price of the high-street models, but was more flexible too. So, as my own little tribute to "Glod", I'm devoting the rest of this column to the current state of play in his beloved "China phone" arena.

Let's start by looking at where you can actually buy these units. You could start on eBay, which has a huge listing of China phones but, as ever, make sure to thoroughly check the seller's recent feedback before placing an order. The same holds true for Amazon Marketplace sellers, as in some respects it's even more of a "Wild West" than eBay. There's Alibaba, too, which is probably best thought of as China's own version of eBay, and is a huge business. As is the case with eBay and Amazon Marketplace, Alibaba is simply the trading platform, and you're actually buying from a vendor in another country. If you'd prefer to deal directly with a Western-friendly e-commerce company, then a couple of good options are DealeXtreme (dx.com) and Banggood (banggood.com). Both have excellent reputations and I've used them many times without any issues.

Of course, buying anything from China raises two potential problems: first, an extended wait of usually several weeks while your package is delivered; and second, the possibility (indeed probability) of being stung for import duties, GST, and a handling charge from the postal service that delivers at the local end. It's this handling charge that hurts most: I received a package recently for which I had to pay a couple of dollars in duty but a stonking \$30 handling

charge – that's almost criminal, but if you want your goodies you have to pay up.

But I digress – back to phones now. If you look on these sites you'll find a variety of smartphones: at the time of writing, DealeXtreme was showing around 950 Android phones in stock, and Banggood a total of 245. You'll find many of them listed with a number such as MTK6582

"Although the EU warehouse is slightly more expensive than the Chinese one, you'll get your items faster, and without having to pay duty"

in their model name, which is the SoC (system on a chip) version they're based on, made by MediaTek (hence the MTK). The MTK6582, for example, is a direct competitor to Qualcomm's entry-level phone chipsets, and contains a 28nm quad-core ARM Cortex-A7 CPU, usually clocked at 1.3GHz.

There's also a higher-end chipset called MTK6592, which has eight cores and is pitched more against high-end Snapdragon 800- or 801-based devices.

When benchmarking MTK6592 phones, I've regularly seen them beat devices such

as the Nexus 5 or LG G3 in terms of sheer grunt, while at the same time being more frugal with their battery use. Although their CPU clock speed may be lower than those Snapdragon processors, their additional cores more than compensate for this.

THE CUBOT X6

There are many China phones out there, but by way of example let's take a look at one that I particularly like, the Cubot X6. I'll start with the most important thing, its price. You can buy this phone from Banggood for around \$210 (the price will fluctuate due to exchange-rate differences). That's without any import duties to pay, and it includes shipping; you can even upgrade to first-class postage!

For your two hundred or so dollars, you get a solidly built phone with a 5in display that's only 720 x 1,280 pixels (so it can't be classed as "Retina" resolution), but it's perfectly serviceable. The Cubot has a 13-megapixel camera on the rear and a 5-megapixel unit on the front, 16GB of onboard storage and weighs in at 164g. While those aren't exactly flagship specifications, by the same token it's way above what you'll find at the budget end of the mainstream market. One thing I do know many of you will love is that this phone has a removable battery – something increasingly rare these days.

▼ On one side we have a "genuine" HTC phone sold for hundreds of dollars...



It has twin SIM slots too (you'll find that many of these phones do), and an SD slot, something that's sadly missing from far too many current flagship phones. The only possible downside is its lack of 4G connectivity.

I think it's a great phone – a brilliant performer for an incredible price – but it's by no means the only player in this market. When you're looking at the various phones on offer from these Chinese suppliers, and especially at their prices and chipsets, you also need to pay attention to matters such as which version of Android they're running – at the time of writing, none of them are being offered with Lollipop (Android 5), but the better ones will have KitKat (4.4, even better still if 4.4.2) – and also their form factor, how wide the bezel is around the screen, how heavy the device is and so on. Both DealeXtreme and Banggood publish user reviews on their sites, so scan these before making a purchase, and also do a quick Google search of the phone model and the word "review".

LIMITATIONS

When sifting through the handsets on offer, you'll see some China phones that can cope with 4G, but be aware that the majority won't do 4G at 800MHz. You'll also notice names such as Lenovo popping up in listings – these phones

✓ and here we have a Cubot X6, costing just over \$200

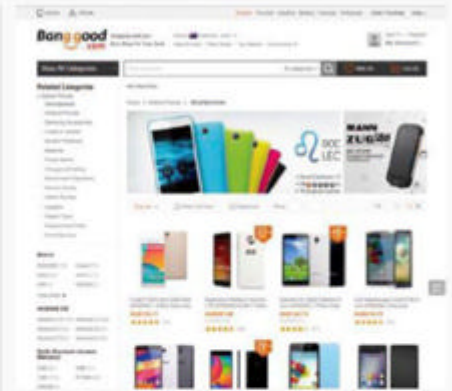


aren't knockoffs, because as well as being a purveyor of reasonably expensive (and, indeed, very nice) computers and tablets here in the West, Lenovo also sells many budget phones in China. Other companies that usually produce nicely thought out products are Doogee (yes, really!), THL and, of course, the aforementioned Cubot.

It's strange how many people will talk about these China phones in a derogatory way, often forgetting that the vast majority of high-end smartphones are

“These cheap China phones do seem to be having an effect on the mainstream market here in Australia”

also made in China. Some of the high-end units are even made in the same factories as cheap Chinese imports, which is why you'll sometimes see names such as Foxconn (one of Apple's suppliers) listed among the product names. However, I wouldn't allow this to sway your decision over which unit to buy, since it doesn't differentiate the better phones. What you should be aware of is that phones with names such as Z2, G3 and Note 4 aren't Sony, LG or Samsung devices: they'll often look a bit like the real thing, sometimes



▲ Retail site Banggood has surged in popularity as stock of cheap Chinese phones expands

almost identical, but a quick check of their specifications will confirm that they're not – it's just someone in China playing fast and loose with international copyright law.

These cheap China phones do seem to be having an effect on the mainstream market here in Australia. Many of the big manufacturers now have low-end products available at around the \$200-\$250 mark, but on the whole these tend to be deliberately hobbled so as not to cannibalise the sales of the higher-end handsets that you'll see in the high-street stores. As a result, such "low-end mainstream" models aren't a patch on the better China phones. Another recent twist to the market is that the Chinese have now started to introduce their own high-end branded products, the most notable of which is the OnePlus One (the OnePlus Two should be out in the next few months).

In case you haven't heard the noise surrounding this manufacturer, the One is a great device, available at a bargain price (\$549 for a high-end phone with 64GB of storage). Not quite as low as other China phones, but about half the price of a similarly specified flagship handset from one of the big brands. I was planning to write about the OnePlus One this month, but changes are afoot and it appears that the manufacturer may be about to change the flavour of Android that it uses on the phone, so if all becomes clear by next month, then I'll write more about the phone in that column.

In the meantime, I'd encourage anyone thinking of upgrading their phone (or perhaps just looking for a spare) to check out these China phones. Once upon a time, they could be a bit iffy and a somewhat risky purchase, but now there's much to commend and being able to buy them from a single online store with prices quoted in Australian dollars makes it a no-brainer. Steve Gold was right after all, and I just wish he was still around so that I could tell him. ●



ROGER CAREY

"WHILE WE ALL AGREE WHAT A BIT OR A BYTE IS, WE SEEM TO HAVE NO DEFINITELY ACCURATE TOOL FOR MEASURING THEM"

When is a gig not really a gig? It's no academic question when you're an ISP setting a download limit, but the answer is tricky to nail down

How much? I can't possibly have used that much!" These are words we often hear at the end of a month, when we reveal to our rural wireless-broadband subscribers the amount of bandwidth they've used.

Here at Village Networks, we encourage our subscribers to conserve bandwidth. We explain that it's a limited resource, and that our ability to provide equal access to all our subscribers relies on everyone's adherence to the agreed allowances.

A truth of ISP management is that the faster the connection, the more users will download. With 2Mbps/sec, it isn't worth trying to watch anything from Netflix. With a 24Mbps/sec connection, you can watch two Netflix movies, over the same connection – and if you can, you will.

So, as we've followed market forces and upped our connection speeds, we've also seen significant growth in download volumes. Currently, 85% of our subscribers still meet their entire internet needs with a 60GB monthly download allowance – average use is around 20GB. The other 15% have unlimited hunger, and that proportion is growing.

Village Networks has around 1,000. Much as we'd like to offer unlimited use across the majority of our network, this simply isn't possible. So our subscribers have a choice: breach your monthly allowance and accept a temporary speed restriction, or agree to pay extra.

It's hard to avoid the feeling that some otherwise quite tech-savvy subscribers are trying it on. "It wasn't our fault. There's a problem with our smart TV. It downloads movies even when it's switched off."

Other users, however, can be genuinely perplexed by the amount of bandwidth

they get through. And while we can supply them with a figure of use, we can't provide the details they crave – was it really that much? When did I use it? Was it on the desktop or the iPad?

A SECOND OPINION

At Village Networks, we're cautious about recommending third-party software and apps. They're not ours. We can't take responsibility for them, or provide support for them. We already spend enough time winking out spyware and adware, worms and trojans from subscribers' PCs. This isn't what an ISP should be doing. But we're a caring and service-driven bunch, so when we have to tell a subscriber that they've exceeded their monthly allowance, it seems harsh to simply say "that's what our monitoring systems say, so tough".

We thought it would be helpful to suggest some third-party bandwidth monitors. These would let customers track for themselves, if not where, then at least when their download traffic is peaking.

We decided to carry out an appraisal of some of the bandwidth-monitoring software that's already out there. We were looking for something that was free, and easy to install and use; something that

would display the data in a format that could be easily understood.

Our findings surprised us: we saw significant, haphazard, inexplicable variations in measurements. The differences, on any given day, were of as much as 100MB.

METERING

We've been testing FreeMeter, BitMeter, NetWorx and tbbMeter. (There are others we haven't yet tested, but there are only so many hours in the day.) They're simple and run themselves in the background – except FreeMeter, which usually seems to uninstall itself whenever it's closed or a device is rebooted. Stack them up with their impressive graphic displays in vertical alignment, and as the bar charts track from right to left, the spikes and troughs appear to march in reassuring unison.

However, as the data accumulated (see table below), something didn't seem quite right. On a typical day, 5 November 2014, the software displayed the following results: FreeMeter 27MB; BitMeter 27MB; NetWorx 14MB; and tbbMeter 14MB. Although the first two agree roughly, as do the second two, the difference as a proportion is huge. And it's much

	MB downloaded			
Date	BitMeter	tbbMeter	FreeMeter	NetWorx
20 Oct	783	701	760	774
21 Oct	290	233	280	248
26 Oct	145	37	140	40
27 Oct	226	115	220	123
28 Oct	641	286	641	299
03 Nov	102	60	102	25
10 Nov	735	318	727	347
20 Nov	117	23	117	26
01 Dec	123	75	110	83
02 Dec	634	587	634	619



ROGER CAREY

Roger is the chief marketing officer for Village Networks, supplying rural broadband connections

◀ Our results from testing four bandwidth monitors show huge discrepancies

“Over a typical four-week period, we found a difference of 35% between the smallest and largest total”

more than can be accounted for by the difference, say, in bits and bytes.

Concerned, we ran comparison tests over three machines, two running Windows XP, one running Windows 7. Our usage models ranged from heavy multimedia business use to my 93-year-old mum on Skype and email only. We found similar random discrepancies.

We began testing in October, and continued until the end of December. At the beginning of the project, we didn't plan to test for that length of time, but since the big discrepancies kept appearing, we felt a duty to continue.

Over a typical four-week period, we found a difference of 35% between the smallest total and the largest: 7.3GB reported by tbbMeter, and 9.9GB reported by BitMeter. Something wasn't right.

Some of the software is machine-resident and some of it is server-based. BitMeter's totals quite closely match those of FreeMeter; tbbMeter's results have a broad similarity to NetWorx. But how can one explain the difference between the results on, say, 26 October or 20 November? The differences tended to be greatest among the smaller numbers. But even on the heavy download days, while there appears to be better agreement, there's still no consistency or pattern. When compared with the spread of results in our tests, our own metering – resident on the system routers – comes out on the high side of the middle. It's integral to our network, so we regard it as definitive.

We raised the question of wild discrepancies with tbbMeter's sponsor, Thinkbroadband. The response was sensible – is tbbMeter measuring LAN traffic as well as the host device's internet traffic? The answer was no. And tbbMeter tends to produce lower totals than its peers, anyway. But neither were any of the other monitors counting any traffic other than that from the host machine. How can we be sure? Well, fetching a 10GB download on each of the other machines on the network and seeing no acknowledgement of that in the monitoring software is pretty good confirmation.

While we can say some monitors produce similar results to others, and some match our own measurements, we can't say which is accurate and which isn't. But this isn't the issue.



MEASURING FOR SIZE

The issue is this: we ask people to pay for their bandwidth by the GB. What happens when Village Networks says, “you’ve just downloaded 75GB”, and the subscriber’s own measurement software says they’ve downloaded only 50GB?

If the man on the fruit stall sells us a kilo of apples, it had better be a kilo, or he’s in trouble. Gas, water and electricity meters are calibrated and certificated. But, while we may all agree what a bit or a byte is, and how many there might be in megabyte and a gigabyte, we seem to have no definitively accurate tool for measuring them. I don’t suggest that the authors of current software are incompetent, or mischievous. But it’s clear that they’re not all measuring in the same way, or with the same precision.

There’s a second problem. Software installed on a device only measures the traffic to and from that device. Nowadays – as we so often have to remind subscribers – it isn’t only the desktop that’s munching through bandwidth; it’s the laptops, the tablets and the smartphones too. For those with home offices, it can even be the email-capable printer. And does the Wi-Fi-connected camera automatically update its OS twice a month?

You see our point? For a clearer picture of the numbers, measurement should be via a router. Indeed, SNMP-enabled managed routers do have this capability. Most Cisco routers have the NetFlow

▲ At first glance, the peaks and troughs measured by different software appear the same – but that’s not true of the total data “downloaded”

analysis tool built in, but managed routers aren’t often available at home-network prices, and unless mum or dad happens to be an experienced sysadmin, it’s probably best not to try actually managing the managed router.

A typical home user doesn’t want to get involved, and usually can’t get involved, in fiddling with router firmware, or setting up IP packet-sniffing technology.

Even if there were a home-priced router that could report on which device did what and when, could we be certain that the total gigabytes downloaded would agree with any other brand of router? Or, indeed, with the ISP’s meter? So far, all the signs point to the answer being no.

In our very simple tests, we compared only four of the most commonly used monitors. There’s a handful of Windows OS bandwidth monitors out there, plus apps for iOS and Mac devices, and Android devices too. Are they all calibrated to agreed standards? If they’re measuring paid-for use, shouldn’t they be certified? And shouldn’t a requirement of certified calibration apply both to the supplier and the subscriber?

Although backhaul continues to get cheaper, we’re still a long way from universally unlimited broadband. Until that time, there’s a need for accurate measurement to agreed standards. ●



DAVEY WINDER

"THERE HAVE ALREADY BEEN REAL CASES OF BABY MONITORS BEING HACKED INTO FOR SPYING PURPOSES"

Wireless technology opens up a whole new threat to hacking; knowledge is key if you're to avoid being the victim

The Internet of Things (IoT) has opened up a new can of insecure worms, a subject I've commented on before. The usual response is that the threat of devices such as smart power meters becoming vulnerable to back-door attacks – or clever heating thermostats being ramped up to create National Grid havoc – is merely alarmism, a kind of science fiction. However, the fact is that there have already been real cases of baby monitors being hacked into for spying purposes, and connected cars becoming liable to interference by remote hackers. Tim Rains, Microsoft's director of cyber-security and cloud strategy, has stated that, "some of these devices lack basic security capabilities, while others have security capabilities but they're inappropriate for all the scenarios that the device can be used in." Microsoft is committing to making IoT security a priority as a result.

But there are some threats that aren't new, and they're not being taken as seriously as they should. Most people are at least aware of the risk inherent in using free, unsecured wireless internet in public places, but how many are concerned with wireless-keyboard insecurity? The notion of keyboard insecurity itself isn't new, and the threat is pretty obvious: "keyloggers" have been around for some time. Indeed, I was using a home-brewed one to capture keystrokes and hide the output inside image files (using steganography) some 20 years ago to great effect. In my days as a hacker – as in "explorer of networks" – this trick enabled me to access the online accounts of anyone who used my computer while visiting my home, and that included sysadmins who should have known better. That kind of technology went on to become part and parcel of the hacking scene, and continues to be used today (minus the steganographic shenanigans) by cybercriminals to grab

people's logins. Internet security systems are well aware of it and have plenty of measures in place to prevent such threats, with more clued-up transactional services using virtual keyboards as a defence against this method of attack.

I started thinking about capturing key data from a wireless keyboard after a client asked me whether some new hardware he'd seen advertised was worth the not-inconsiderable investment: a "secure keyboard" that retailed for almost \$200 in the USA. It was a wireless model that employed 128-bit AES encryption, alongside a USB nano-receiver to ensure all communication between host computer and keyboard was encrypted. It did have a few positives, such as a ridiculously over-specced 1,600mAh battery that promised half a year from a single charge, and I approved of its mechanical key action, but as to whether my client actually needed such a keyboard, my answer had to be no.

He didn't really need a wireless keyboard at all, and using a wired one would eliminate the risk he was worrying about (and he'd only started worrying after reading marketing material for that secure keyboard).

I pointed out to him that the risk was miniscule in the real world since wireless-keyboard signals are notoriously weak, so a hacker would need to be in the same room to intercept those signals. There's the laptop-in-café scenario, but who uses a wireless keyboard with their laptop? Most major keyboard manufacturers actually build signal encryption into their products, rendering a more expensive keyboard redundant. So I advised against this unnecessary expenditure, and then forgot about the potential for wireless keyboards to become risky – until now.

The reason for my memory jerk is a rather clever and worrying device called KeySweeper, which for less than \$40 introduces a new risk to the keyboard-capture equation. KeySweeper is the proof-of-concept brainchild of security researcher and hardware hacker Samy Kamkar (twitter.com/samykamkar). It employs readily available Arduino-based

components to create a "functioning USB wall charger that wirelessly and passively sniffs, decrypts, logs and reports back (over GSM) all keystrokes from a Microsoft wireless keyboard in the vicinity."

Data-logging USB chargers first came to my attention during the football World Cup in Brazil, when reports circulated about such devices being deployed in airport and hotel lounges to grab data from connected devices. However, this was the first such wireless-scanning device I'd seen designed to connect to any wireless keyboard in the vicinity (not only Microsoft) and log all its keystrokes to internal flash memory, then transmit these logs remotely via GSM. Samy notes that the GSM module will trigger SMS alerts on certain keywords, such as usernames and URLs, which then recall the stored passwords – clever stuff. Actually it's all very clever, from the simplicity of the Arduino microcontroller at its heart, to the internal battery that enables it to keep scanning and collecting even if someone unplugs it from the wall, then recharges when next plugged back in. The most worrying part, though, is the low cost for which it can be constructed, which makes it something of a fire-and-forget disposable device for determined hackers.

If you want to see exactly how Samy built the KeySweeper – and understanding how such devices work is essential to protecting yourself against them – then head to samy.pl/key sweeper.

Its Arduino microcontroller is partnered with an nRF24L01+ radio-frequency chip, modified by Samy to get around its limitation of only really being meant to communicate over proprietary protocols. This is achieved by use of an XOR algorithm to encode keystrokes against the keyboard's MAC address as a key: read that MAC address over the RF chip and you're only a step or two away from decoding the data. Samy chose older (pre-2011) Microsoft keyboards as his target, since the first byte of their MAC is always the same (0xCD), which makes decrypting keystrokes even easier. Microsoft points out that it does sell keyboards made after 2011 that use AES and so aren't vulnerable to the technique, and none of



DAVEY WINDER

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its Bluetooth-enabled keyboards can be sniffed this way.

My main advice to my client still stands: if you don't absolutely need a wireless keyboard, then why introduce the risk? Unfortunately, my forays into business premises – from the smallest start-up to the largest enterprise – inform me that the trend is towards wireless everything, and so my reluctantly modified advice is that if you have room for a wireless USB nano-receiver, then you have room for Bluetooth; Bluetooth wireless keyboards are far more difficult to crack (although not impenetrable). And if you really must use a 2.4GHz keyboard, at least check that it employs some form of AES signal encryption out of the box.

FACEBOOK'S STUPID AD POLICY

Someone recently suggested that Facebook is like Marmite – you either love it or hate it – but I think it's actually more like Radio 4; sometimes it's annoying, but you can't live without it. However, unlike Radio 4, Facebook carries advertising, which is the cause of much of users' annoyance. Not the ads themselves so much as the utterly pathetic way in which they're targeted. Facebook goes to great lengths to try to help advertisers create campaigns that reach their intended audience, so why is it missing by a country mile?

Surely I needn't provide examples of how irrelevant Facebook ads can be, as we've all seen plenty of them in the sidebar or inserted into our News Feeds? Sometimes the dissonance is the advertiser's fault, since they don't appear to realise that broad sweeps are less effective than fine brushstrokes when it comes to selecting their audience. Sometimes it's the user's fault for disabling options in the name of privacy that might give advertisers' shots a clearer aim. Most of the time, however, it's just Facebook being dumb, and thankfully there are several options available to

counter this madness.

First, you need to understand how Facebook determines who sees what, which in essence revolves around the information you share, the information provided in your profile, and the information advertisers have gathered about you from websites besides Facebook. Luckily, you do have some control over all of this data, and that begins by you clicking the top-right corner of an advert and telling Facebook you don't want to see it. This should remove you from those audience groups, thereby refining the ads you do see. The best advice I can offer, though, is to filter them out by using software such as Adblock Plus and Social Fixer, which do a good job of making most Facebook ads invisible to me online.

GLOD: AN INFORMATION SECURITY LEGEND

Steve Gold, who sadly died on 12 January 2015, days before his 59th birthday, was more than just a veteran security journalist and pioneer hacker – he was my friend, mentor and inspiration. It's no exaggeration to say that were it not for Steve (known as "Glod" to many) and his partner-in-crime Robert Schifreen (aka "Hex"), I wouldn't be writing for *PC & Tech Authority* today. Steve and Robert, you see, were instrumental in getting me interested in network security and hacking.

I used the term "partner-in-crime" but the truth is, back when this pair successfully hacked into the personal message box of one Prince Philip while "exploring" BT's Prestel Viewdata service at the end of 1984 and start of 1985, hacking really was a case of system exploration minus the malicious intent. Many of us old farts of online technology journalism cut our teeth on dial-up systems such as Prestel, Micronet, FidoNet and CIX, which served a similar role to Facebook before the public internet explosion. Indeed, the true definition of a hacker was (and remains) someone who

wants to find out more about a technology, be that hardware, software or network.

Ultimately, the police got involved after the hack was disclosed to Prestel, but they struggled to find anything to charge them with since hacking wasn't illegal at the time. Instead they were charged under section 1 of the Forgery and Counterfeiting Act 1981, accused of defrauding BT. Long story cut short: both were found guilty of several specimen charges and fined.

Steve went on to pursue a career in journalism, but it was his role in the Prince Philip hack that first grabbed my attention, soon followed by his account of the affair when he edited the fourth edition of *The Hacker's Handbook*. This book, written by Professor Peter Sommer under the pseudonym of Hugo Cornwall, had been regarded as the hackers' bible for a few years, and the addition of Glod as co-author for what became its fourth edition was a masterstroke. It was the book that not only inspired me to explore networks for myself in the late 1980s, but it also served as my technical roadmap for that exploration.

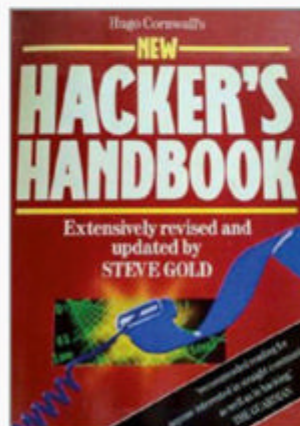
As security journalists, Steve and I followed similar professional paths, although Glod with far more success. As well as spending many years as a fraud investigator for the NHS, Steve had been instrumental in launching the Newsbytes News Network. He helped launch *PC Dealer* in 1989 before becoming its editor a few years later, and also co-founded the first dedicated IT security publication, *SC Magazine*, in 1994. Ten years later he joined *Infosecurity Magazine*, where he ended up as Technical Editor. At the time of his death, Glod was running an arts shop, helping write press releases for a PR company, and editing *Lawtech Magazine*.

Steve's understanding of the infosecurity landscape was immense, and he possessed the same level of knowledge when it comes to mobile phones and didn't keep it to himself. I realise it was his job to write about his knowledge, in the same way I try to, but Steve would share with anyone who asked. He was always happy to help out PR folk, the security industry itself, even little old me, regarding anything with which we were having problems. I'd often turn to Steve for technical advice when I got out of my depth, and he'd always oblige with a smile and stunningly accurate information, no matter how busy he was at the time. Glod, I shall miss you – and the data-security world will be poorer without you in it.

Find out more about Steve Gold at the Silent Modems memorial site (silentmodems.com).

◀ The *Hacker's Handbook* propelled me into the world of network exploration

▼ The KeySweeper device has exposed the wireless keyboard security risk you didn't know existed





STEVE CASSIDY

"THE IDEA WASN'T SOME IMPOSINGLY ACADEMIC BRAIN-BENDER, BUT THAT BIG DATA HAS ARRIVED IN HPC LAND"

A trip to a high-performance computing facility offers up a tear-jerker from the field of computational genetics in medicine

And so to Cambridge, the hoar frost fresh upon the withies beside the track from Liverpool Street station. There's something about visiting an 800-year-old institution by train that makes me think of powdered wigs, clay pipes and quill pens, and while I realise that's a heap of anachronisms bundled into a foggy overview, that's actually my point. Eight-hundred years of deep thinking is the hallmark of a federated mass of colleges, and their approach to information technology can't remain immune to this effect. So how was it that a single professor's presentation led me from high-performance computing (HPC), InfiniBand and gamers' graphics cards, right through to the pathos and high drama of sick children, family breakup and ruined lives?

This trip to Cambridge was all about supercomputers. Back in the day, a supercomputer was just an XXL-sized mainframe, heavily sprinkled with LEDs that couldn't possibly keep up with all that was going on within the beast's liquid-cooled guts. This remained the common perception of high-end computing for decades, and if you listen to the guys who founded the original Cambridge HPC Service (HPCS), it was they who took the brave leap by moving away from this manufacturer-blessed approach towards deploying "commodity hardware" – that is, top-end versions of PCs, much like those we use to run our businesses if we can justify such CPU-heavy configurations.

I realise that to many people the word "commodity" always implies "unbranded, build it yourself" – with the further implication that this is the road to a cheap architecture – but whenever I visit people who talk about this kind of architecture, I invariably discover that their definition of "commodity" stops short of

that evangelists' dream. One such client ran web spiders on Dell Vostro desk-side boxes, because they wanted quad-core CPUs and a middling amount of memory, with a reasonably sensible swap-out maintenance contract that fitted with their reload/recommission/rerun cycle. A full-scale server rack might have failed less often, taken up less floor space and looked better in their brochure, but while they couldn't justify the spend on a full-blown data centre, neither did they want to take the risk of actually wielding their own screwdrivers.

Cambridge HPCS has shifted this decision point further up the price/performance curve: they're not afraid of screwdrivers, of course (as the inclusion in Professor Ron Horgan's slide deck of Maurice Wilkes working on the world's first

"The amount of data used by HPCS customers has gone up by 100 times since 2010"

general-purpose computer in Cambridge in 1947 amply demonstrated), but the reason we journalists were invited there at all was that the latest iteration of their HPC cluster is furnished by Dell and contains a lot of accelerator cards developed by Intel.

The odd thing about this project is that while the initial assumption has that "commodity" tag written all the way through, the actual implementations are remarkably restrictive. You could, in theory, choose to go with a complete ragbag of heterogeneous PCs, all running OpenFOAM (assuming your HPC job is about 3D modelling – although not all are) and linked together via Ethernet, but then your results would depend on the completion of this mongrel network's slowest member, and the ability of said network never to drop a single errant packet. Those who need to do week-long runs on vast quantities of both data and

calculation prefer to rely instead on fully tested and technically specified InfiniBand networks, connecting cluster members, controller members and storage resources; and while InfiniBand isn't proprietary, it's hardly "commodity" either.

MAKING THE NUMBERS COUNT

Anyway, to be honest, I wasn't all that interested in the exact specification of the stack of kit that makes up the HPC cluster at Cambridge – it contains around 9,600 cores, uses Intel expansion accelerator cards (not Nvidia CUDA) that, along with the main CPUs, the InfiniBand hardware and the basic OS, are all installed inside Dell servers that you can buy off the shelf.

The funny thing was that, despite this being an event hosted by IT businesses selling CPUs and system speeds as their distinguishing factor for years now, this wasn't what took up most of the presenters' time. Dr Paul Calleja runs the HPCS these days, and he set what I consider to be a very Cambridge tone by chuckling over how easy it was to demonstrate a major trend simply by re-inserting some old slides from a previous presentation. (Worryingly, for me at least, he considers 2010 to be "old" in HPC terms.) And the takeaway idea wasn't some imposingly academic brain-bender, but rather that Big Data has arrived.

While the amount of data used by HPCS customers has gone up by 100 times since 2010, the amount of CPU power squeezable into the HPCS's departmental budget has increased by only ten times, and against the background of some truly astounding increases in speed and bang-per-buck. I wondered whether this also had something to do with post-crash austerity, but from the various figures being bandied about, and the stories of cross-connections between academia and everyday industry, I suspect that the HPCS team can find extra cash – but only when it's absolutely confident it can show a speed increase by spending it. The HPCS definitely earns its keep nowadays. Far from those disciplines that have traditionally pursued heavy-duty compute



STEVE CASSIDY

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power – pure maths, particle physics, meteorology and cosmology, for example – the majority of the clients Calleja sees may not require such long runs. However, they do bring with them a shed-load of data – and biology is the leader of the whole pack.

The main thrust of Professor Willem Ouwehand's presentation didn't dwell much on terabytes or hours of runtime while introducing the application of HPC as a resource in biology: rather, he explained the scale and nature of the problem of rare, genetically caused diseases. Of the 800,000 babies born per year in the UK, for example, around 40,000 have a disease that's caused by a transcription error in DNA or a poor genetic match between the parents. Recently there's been a rash of disappointed science pundits who look at such genetic flaws, then turn to look at the Human Genome Project and complain bitterly that public money (actually it's charity money, but hey) is going to waste on a fool's errand. Not Professor Ouwehand.

Rapid genotyping of the entire genome – the Americans apparently only go in for selected subsets – then collecting samples from those diagnosed with rare diseases, is very likely to deliver huge, genuine benefits, with direct savings for both the NHS and everyone involved with the care of a sufferer from a rare disease. Ouwehand showed an infographic from the Shire group to get this point across.

Professor Ouwehand also showed us how hungry this genotyping is for HPC power. Quite simply, the nature of rare genetic diseases is such that, on average, diagnosis takes something like five years for your standard, unassisted human doctor to complete. This isn't a matter of "must try harder" or "could be better with a few more quid to spend"; it's an inherent and intractable limitation of the process of diagnosis as it's performed today. Ouwehand painted a picture, made possible by 2015 performance levels

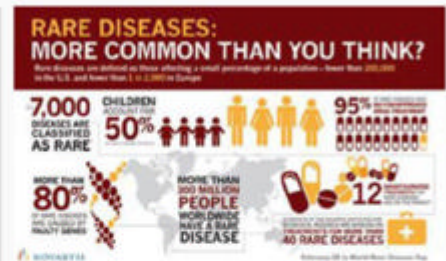
➤ CUDA-based GPGPU supercomputer clusters are powerful and affordable



in HPC clusters, which gives doctors access to a cloud resource of rare-disease diagnostic Q&A, thereby usefully shortening the time taken for a diagnosis.

One statistic he delivered – which wasn't on that Spire infographic – is that by the time a child's diagnosis of a rare disease is complete, 50% of the parent couples have divorced. Now make no mistake here: genomics is about rapid identification of such a disease, not about curing it, and it's arguable whether the cause of a couple's split was the baby's sickness, the delay in bureaucratic processing or the guilt stemming from such imperfection. Regardless, there's no doubt that it's worth striving to reduce that five-year diagnostic task – with an average of eight specialist visits and who knows how much GP time – for syndromes that might be far more easily handled once correctly identified.

The hardware that's being used for this grunt work – the sequencing and pattern-matching of genetic material and the cross-correlation with patient complaint and treatment records – isn't all that



▲ High-performance computing could help with the diagnosis of rare genetic diseases

"commodity": it's a room full of standard servers and several rooms full of spinning disks, hosting specialised datasets ready to be delivered to superfast, generalised hyper-speed compute resources installed closely to small caches that help with queue management. This architecture exists because, in the noughties and before, the games industry focused so keenly on the expansion architecture of the IBM PC platform as its best hope for better game performance. In particular, it focused on the highly commoditised graphics card as the best place to hide all the ultra-high-speed processing power, so that gamers could boost speeds without having to throw their whole machine away.

This is the market that gave rise to CUDA, and hence to huge amounts of available CPU power that far outstrip most people's daily graphical needs – and without the competitive pressure of the graphics card vendors all aiming for higher benchmark scores, there wouldn't have been enough teraflops available to the HPC system designers to address problems such as the one posed by the





^ The ZyXEL NXC2500's basic-looking box hides a top-quality software platform

genomics of rare diseases.

So when you hear someone burbling away about the misspent youth of spotty gamers, or the dangers of violent games, ask them how many years they'd prefer it to take for a diagnosis of familial hemiplegic migraine or craniopharyngioma to be finalised – because the excesses of the first group appear to have driven the rapidity of help for the other.

ONE STEP UP IN WI-FI

Let me step a little carefully here. In all the places I visit – and I really do mean all of them – I encounter a specific make of DSL router and Wi-Fi base station. It's a brand that's been around for years and clearly attracts immense loyalty and customer engagement, with almost every *PC & Tech Authority* reader in each business I see having nothing but praise to heap upon it. How any entrepreneur can get their customer base to feel so engaged with a cheap plastic box adorned with a few poorly aligned LEDs is a mystery to me. It definitely works, though, and I learned pretty quickly not to criticise this DSL: casting aspersions on its software architecture or the code quality of the firmware in this particular model was never the right way to kick off any client relationship or any Business Clinic visit.

It took time for me to separate cause and effect in this matter – that is, both for my own dislike of the whole range and for the loyalty to it I kept encountering. Eventually the penny dropped: almost nobody I was meeting really felt they comfortably understood how to relate the way IPv4 worked inside their network to the way that their ISP made IPv4 deliver internet traffic to their network. Especially at the lower reaches of the marketplace, the apparently hard-and-fast rules that you'll read in the usual Wikipedia pages, original RFCs and other (allegedly) canonical resources

"Nobody I met had understood how to relate the way IPv4 worked inside their network to the way their ISP made IPv4 deliver internet traffic to their network"

just didn't seem to be applied by internet access companies. Traceroute reports with packet paths jumping into and out of private range networks; ISP hardware device addresses outside the subnet you're told to use as your own; multiple subnets displaying radically different hop counts to reach the same targets: the list of their transgressions is as long as it is incomprehensible.

Quite a lot of you, dear readers, have taken the view that arriving at a full understanding of such nonsense wasn't a business-critical activity, and so you plumped for a router that reflected the mysterious nature of these peculiar connections by not implementing the standard presentation of a device worthy of the name "router" at all. This is the type of device that fudges the distinction between inside and outside the network, and hence makes it difficult to establish whether what you're doing to move special types of traffic is actually full 1:1 NAT or selective port forwarding. And this is why an entire market sector has convinced itself that networking is difficult, and that pricier networking products are therefore going to be complicated. My own experience and conviction is that nicer networking products make your life easier, not harder.

Of course, if you've hacked your way into making something work reasonably well

using a super-cheap ISP contract, then the first thing a more expensive and more standard device will do is fail to work over your connection, since that connection won't meet its standards-defined needs. Most often my input in this situation is to run a few demos that show how climbing just a couple of rungs up the spending ladder can deliver huge benefits that aren't obvious from a vantage point way down at the bottom. One recent example I've been playing with quite frequently is the ZyXEL NXC2500. Take a look at its specification at <http://tinyurl.com/qe39lvc> and the photo to the left.

I know what you're thinking: that looks just like those basic devices that ZyXEL sells into the same market as my unnamed router vendor. Indeed it does, but the moulded plastic of its case is no guide to the quality of the software inside. Perhaps the best guide to that is the physical weight of the unit; this isn't a mostly empty plastic box with a tiny PCB in one corner, nor does it limit itself to a single function of brokering a public and a private network as cheaply as possible.

A careful reading of its feature set is a good way to understand how the issues that often confront a network manager in a small business can be met without driving a coach and horses through compliance with the standards. However, I have to be honest and say that those parts of the system that concern themselves with operating as a mesh of controllers inside a VLAN, to fully segregate a multi-access-point Wi-Fi fabric from the business network it's obliged to share wires with, are every bit as confusing as the config shortcomings in my least favourite router brand.

But the core point in this argument is that such confusion is productive. Unlike the first type of confusion, which misrepresents IPv4 and wide-area-traffic setup as a black art with no way out, the kind of environment you can work with inside a properly thought-through device such as the NXC2500 (or some of the bigger TP-Link models, or the Netgear Professional range of routers and gateways) makes it easier to understand the thinking behind the architecture of the standards, not more difficult.

I realise that sharing this aperçu might not directly help my own revenue stream: ideally, I should be proposing the least comprehensible platform I can find, so that I can arrive via the window in a swirling cape and wizard hat. But really, it's now 2015, and routers whose software platforms remain largely unchanged since the 1990s need to be put into a cupboard and left there – not looked upon as vital, untouchable parts of your business. ●



WHY MYER WANTS A TECH-SKILLED CEO

Ry Crozier examines the benefits of stacking the executive with digital nous

Is a CEO with a background in technology and supply chain the key to driving disruption from the top down in a retail setting? Myer hopes so.

The retail giant surprised many this week when it revealed Bernie Brooks would immediately step down as CEO and managing director, replaced by CIO and supply chain officer, Richard Umbers.

The company couched the CEO change in no uncertain terms: they wanted someone to oversee a complex, multi-year transformation project that would reshape Myer "for a profitable, sustainable future".

"It has become clear that to thrive in a modern retail environment, Myer must adapt more quickly and be closer to its customers," chairman Paul McClintock AO said.

"A transformation project of the scale required to achieve the Board's vision will take a number of years to implement.

"The Board and management team have agreed that the transformation work has reached a pivotal point and it is appropriate for a new CEO to be given the opportunity to own, lead and drive the transformation program over the coming years."

Exactly what the transformation will entail is unclear, but its design is rooted

in in-depth data analysis and customer research. Umbers is expected to develop a more detailed path to transformation as he settles into the CEO role.

In moving from CIO to CEO, Umbers is treading a succession path that is relatively uncommon. The question is: Will his background give Myer an edge as it seeks to disrupt itself?

Deloitte Consulting partner Steven Hallam thinks so.

"I think it's natural that you would see digital skills becoming more relevant at the C-Level," Hallam told *PC & Tech Authority*.

"Most executives and boards are really demanding digital skills. Digital is part of the core now and is shaping business as a whole."

Until now, Myer has been disrupting itself in pockets. The retailer started experimenting with supply chain systems that could enable dropshipping in 2013; it has also been trialling iPads on store floors and in-store 'hubs' to make it easier for shoppers to interact with Myer.

For this reason, the shift to an overarching transformation strategy will be keenly watched by industry observers.

LONG OVERDUE

In a 2012 report, Deloitte predicted the

"Companies that stood to experience significant digital disruption within the next three years [were] said to be on a 'short fuse'"

retail trade was on a "short fuse" when it came to digital disruption.

"Companies that stood to experience significant digital disruption within the next three years [were] said to be on a 'short fuse'," Deloitte said.

With those three years now largely passed, the urgency for retailers that have not yet embraced digital disruption should – in theory – be significantly heightened.

However, analyst firm Forrester Research reported late last year that "almost two-thirds of retail execs ... do not see digital as a critical driver of business strategy – a shocking figure in the age of the customer."

"This lack of understanding of the importance of digital in retail will become a major problem for retailers as they try to integrate their online and offline channels into an omnichannel customer experience," Forrester said in its Digital Leadership in Retail 2014 report.

The firm said only seven percent of retail executives saw digital "as the most important driver of business strategy."

A Forrester spokesperson was unavailable to provide further comment to *PC & Tech Authority*.

PwC's Retailing 2015 report reinforces the direction Myer is taking to reshape itself, particularly the emphasis being placed on customer behaviour and data analytics.

"Understanding shoppers will be more critical than ever in 2015," PwC said.

"Given the anticipated growth of niche retailing, the diffusion of media and markets and the increasing reliance on point of sale as point of communication, shopper insights captured in the retail environment will be key to driving sales.

"Retailers will need to understand what motivates the shopper at the point of sale."



◀ One of the new in-store electronic kiosks

▼ New Myer CEO Richard Umbers



YOUR TV MAY BE LISTENING IN ON YOU, SAYS JON HONEYBALL, BUT THE REAL PROBLEM IS FAR WORSE

“Poor Samsung. In mid-February, its name was at the front and centre of news reports across TV, the internet and papers, with screaming headlines such as the BBC’s ‘Not in front of the telly: Warning over ‘listening’ TV’.”

The news that smart TVs might be monitoring what you say should come as no surprise. After all, if a device offers the capability for voice recognition and voice control, what do you expect? I guess most people would assume that the technology for this was embedded within the TV itself. But voice recognition works best when it has huge datasets to work with, and that means comparing your words with those of other people, which means running a cloud service where all the data can be compared.

The real disaster, of course, is allowing the story to be handled in this way. And for that, the vendors are entirely to blame.

Far too many companies make assumptions on behalf of their customers, only to discover that customers don’t share them. This could be a cultural thing – Google thought it was perfectly okay to walk around with a pair of glasses incorporating a camera, blithely ignoring the fact that the majority might object to a camera being present in a gym changing room.

Smart TVs don’t only listen to voices; my Samsung TV can also recognise gestures. It does this by pointing a camera into the room, and looking for hand-waving and other movement. This tech is incredibly clever, but the uncomfortable reality is that there’s a camera pointing into the room.

The fact that people are concerned

about this should be of no surprise. The thought of malware finding its way onto a smart TV that allowed for remote activation of the camera is enough to bring most of us out in a cold sweat. Consider for a moment what would happen if this TV were in your eight-year-old’s bedroom, and it was found to be streaming the camera content to a remote site on the other side of the world.

“The problem is that we have no meaningful security firewall within the house, acting as our outer boundary”

The problem isn’t that technology has progressed to allow such things to work. The problem isn’t even that the default mode of operation is to enable these things and not give adequate warning during setup of the potential consequences. Nor is it that some smart TV vendors have been shown to play fast and loose with the information gathered from your device.

No – the real problem is that we have no meaningful security firewall within the house, acting as our outer boundary. It can’t be fitted to the ADSL or fibre router; we need a transparent switch-based solution that sits just inside the router, through which all traffic will flow – including all Wi-Fi.

This perimeter guard needs to be heavily orientated towards user accessibility; most firewalls are frankly quite pitiful in their execution, and their reporting can make a grown man weep. It

should have clear and clean web-based reporting, ideally available through the smart TV screen. It should be heavily monitoring all traffic, both inbound and outbound, to ensure that nothing strange is going on. It should learn the traffic patterns, and work on the assumption that a change to established patterns is likely to be a problem. And then should block accordingly.

Even better, it should act as a VPN endpoint, allowing mobile devices to “call home” through a private VPN tunnel, to be subjected to the house rule set before then connecting to the outside world.

Relying on what comes built into the Sky router or your BT Broadband box is inadequate, since these devices allow all traffic outbound. My box would know that a smart TV was trying to send data to a cloud service, and would lock this down until specifically enabled, with the user clearly understanding the consequences.

The box could do email scrubbing, web-content filtering, antivirus and malware cleaning. It would be the first of a new generation of home-orientated security devices that brought security to the home in a way that really worked.

After all, if we’re going to fit Ethernet to our washing machines, we have to be sure that the home network is safe. Locking down each device isn’t going to work because users will either not know or not bother. We can’t tell visiting friends that they can’t attach their devices to our home networks, but we can ensure that the network boundary is significantly safer than it is today.

We trust our homes to be secure – it’s high time that we have the same level of trust in our home computer networks too. I wonder who will be brave enough to rise to the challenge?



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